Chapter Six

Community Development, Land Use Patterns, and Commuting Choices

1. Introduction

This chapter ratchets the analysis up one level- to the community, or citywide, scale. Community-level analyses are obviously too coarse to address micro-design or site planning issues. Rather, they provide a context for exploring more basic relationships between overall characteristics of the built environment (e.g., degrees of community planning, densities, land-use mixtures, jobs-housing balance) and travel behavior. Thus, this chapter complements the previous two by further exploring the link between the built environments of suburban settings and travel choices, albeit at a more aggregate scale.

The first part of the chapter explores differences in commuting behavior for three classes of suburban communities: traditional towns, edge cities (large suburban centers), and planned communities. Attention is given to how 1990 work-trip modal splits varied among these different classes of suburban communities as well as relative to regional averages. The second part of the chapter explores these relationships abroad. Specifically, the link between land use and commuting characteristics is studied for a number of planned suburban communities outside of London, Paris, and Stockholm. These places were chosen since they provide perhaps the best contexts for studying what is achievable when new town and transportation planning are closely linked, at least in a modern, industrialized setting. International comparisons are also essential if public policy options for influencing suburban development and transportation outcomes are to be fully understood.

2. Traditional Communities and Commuting

Neotraditionalists Andres Duany and Elizabeth Plater-Zyberk have identified a number of older American communities that they attempt to mimic in designing new communities like Seaside, Florida, and The Kentlands, Maryland. First and foremost, these are places that are highly walkable, at least in their cores. All were laid out in a gridiron fashion, with small rectilinear blocks. Their cores contain a mix of retail, office, and institutional uses, and are accessible from nearby neighborhoods. Civic spaces, such as open plazas and inner-city parks, play a prominent role in these communities. Local streets are usually narrow, with curbside parking. Back alleys are also common. In short, these are places designed more for people than for cars.

Table 6.1 lists ten traditional American communities. With the exception of Alexandria and Savannah, all are in the 10,000 to 40,000 population range. Densities vary noticeably among these communities, as do median household incomes. Overall population and housing densities remained

Table 6.1

Physical and Income Characteristics of Ten Traditional Communities in the U.S., 1980 and 1990

1990	Land area (sq. km.)	Population	Population Density (persons/sq.km)	Housing Density (Units/acre)	Median Hhd. Income
Alexandria, VA	39.6	111,183	2,811	6.0	$41,472
Annapolis, MD	16.4	33,187	2,025	3.8	$35,516
Coral Gables, FL	30.6	40,091	1,309	2.2	$47,506
Edmonds, WA	18.9	30,744	1,626	2.8	$40,515
Folsom, CA	55.5	29,802	537	0.7	$46,726
Kingsport, TN	83.8	36,365	434	0.8	$22,750
Lake Forest, IL	42.4	17,836	420	0.6	$94,824
Princeton, NJ	4.8	12,016	2,523	3.0	$43,092
Savannah, GA	162.1	137,560	849	1.5	$22,102
Winter Park, FL	18.0	22,242	1,235	2.3	$37,080

1980	Land area (sq. km.)	Population	Population Density (persons/sq.km.)	Housing Density (units/acre)	Median Hhd. Income
Alexandria, VA	39.6	103,217	2,610	5.3	$21,016
Annapolis, MD	16.4	31,740	1,937	3.3	$17,684
Coral Gables, FL	30.6	43,241	1,412	2.3	$21,863
Edmonds, WA	18.9	27,679	1,463	2.3	$23,940
Folsom, CA	55.5	11,003	198	0.3	$16,444
Kingsport, TN	83.8	32,027	382	0.6	$14,777
Lake Forest, IL	42.4	15,245	359	0.5	$44,767
Princeton, NJ	4.8	12,035	2,527	2.9	$22,056
Savannah, GA	162.1	141,390	872	1.4	$12,483
Winter Park, FL	18.0	22,339	1,241	2.2	$17,091

Source: **U.S. Bureau of the Census, 1980** and **1990**

fairly constant during the 1980s in all ten communities. The least dense community, Lake Forest, Illinois, also had the highest median income. Alexandria, Virginia, was the densest, averaging six dwelling units per gross acre.

In general, residents of these traditional communities were just as car-dependent for commute trips as any resident worker. In five of the ten traditional communities, larger shares of residents solo-commuted in 1990 than did the typical resident in the respective metropolitan area (Table 6.2). In all five of these places, however, median household incomes were well above the regional average, so income itself (rather than urban characteristics) is likely the dominant factor explaining the preference for auto commuting in these places. In general, modal splits did not change much during 1980s — more or less the same relationships held at the beginning and the end of the past decade.

Table 6.2

Comparison of Work Trip Modal Splits in Traditional Communities And Their Respective Metropolitan Areas, 1980 and 1990

1990	Percent of Trips: Drove Alone	Transit	Walked	Mean Commute Time (mins.)
Alexandria, VA	59.1	17.9	3.9	25.4
Metropolitan area	*62.9*	*13.7*	*3.9*	*29.5*
Annapolis, MD	67.3	5.9	8.0	23.5
Metropolitan area	*70.9*	*7.7*	*4.0*	*26.0*
Coral Gables, FL	75.9	3.0	6.5	19.4
Metropolitan area	*72.4*	*5.9*	*2.5*	*24.8*
Edmonds, WA	77.3	5.7	1.7	25.2
Metropolitan area	*72.8*	*7.4*	*3.3*	*24.4*
Folsom, CA	82.0	1.5	2.1	25.0
Metropolitan area	*75.2*	*2.4*	*2.7*	*21.8*
Kingsport, TN	84.9	0.4	2.6	15.1
Metropolitan area	*82.3*	*0.4*	*2.1*	*19.5*
Lakeforest, IL	65.2	13.4	8.6	28.7
Metropolitan area	*66.3*	*14.6*	*4.1*	*28.5*
Princeton, NJ	32.8	5.1	47.3	16.0
Metropolitan area	*71.5*	*6.3*	*5.9*	*22.1*
Savannah, GA	70.5	6.3	4.7	18.7
Metropolitan area	*75.3*	*3.8*	*3.3*	*20.5*
Winter Park, FL	80.2	1.6	4.7	19.6
Metropolitan area	*78.1*	*1.5*	*3.5*	*22.9*

1980	Percent of Trips: Drove Alone	Transit	Walked	Mean Commute Time (mins.)
Alexandria, VA	49.4	19.7	4.7	25.9
Metropolitan area	*53.7*	*15.5*	*5.0*	*28.5*
Annapolis, MD	56.8	6.3	9.7	22.6
Metropolitan area	*59.8*	*10.3*	*5.2*	*26.5*
Coral Gables, FL	69.5	3.7	8.3	19.6
Metropolitan area	*67.4*	*6.6*	*3.5*	*23.7*
Edmonds, WA	69.6	5.1	2.3	24.7
Metropolitan area	*63.9*	*9.6*	*4.2*	*23.1*
Folsom, CA	67.8	2.6	5.1	23.3
Metropolitan area	*69.0*	*3.5*	*3.4*	*19.5*
Kingsport, TN	73.6	0.8	5.2	13.7
Metropolitan area	*69.9*	*0.7*	*3.1*	*19.6*
Lakeforest, IL	56.6	18.2	8.7	29.2
Metropolitan area	*57.6*	*18.0*	*5.8*	*28.2*

change much during 1980s — more or less the same relationships held at the beginning and the end of the past decade.

Transit only played a significant role in the two traditional communities served by urban rail — Alexandria (Washington Metrorail) and Lake Forest (CTA and Metra). In six of the traditional towns, lower shares of residents commuted by transit than in their respective regions. In these places, income differences are probably again the chief reason for differences in transit modal splits. Relative to the suburbs of each metropolitan area, traditional towns did slightly better in attracting transit commuters. Figure 6.1 shows that for eight of the traditional communities for which comparison data could be obtained, larger shares of residents commuted by transit than did residents of the typical regional suburb in the majority of cases.[1] Since comparisons with surrounding suburbs are more appropriate than for the metropolitan area at large, it appears that traditional communities did have a slight edge in promoting transit commuting.

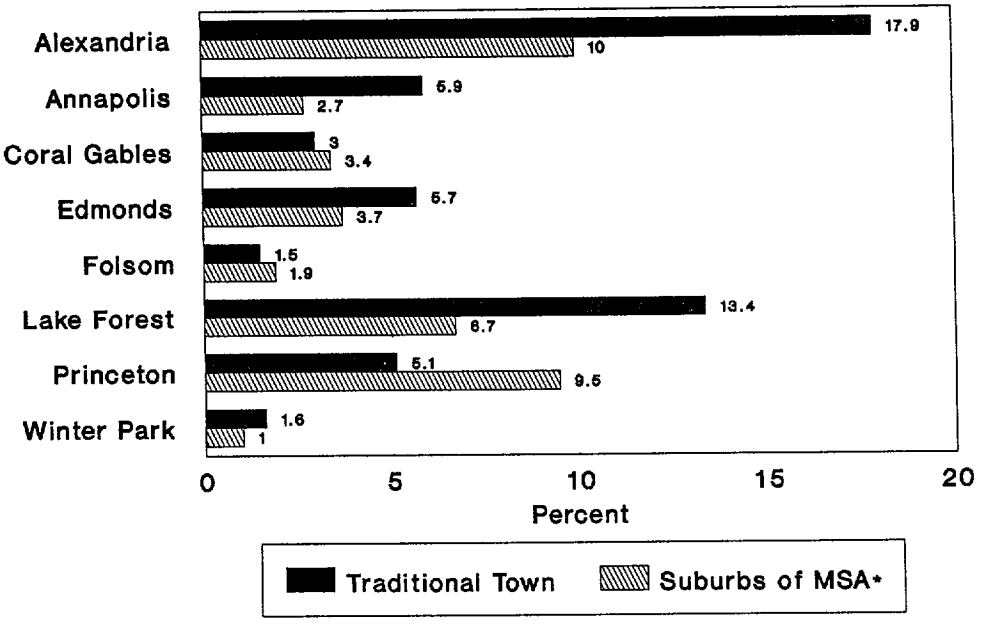


Figure 6.1

Comparison of Transit Share of Work Trips in Traditional Communities and Surrounding Suburbs, 1990

Traditional communities show their greatest advantage with respect to walk and bicycle trips. For seven of the communities, a higher percentage of residents walked or biked to work than did the typical worker in each region.[2] In Princeton, nearly one-half of those heading to work walked or cycled — no doubt, partly because Princeton is a college town with a fairly captive and autoless student population and restrictive parking but also because it is of an eminently walkable scale

(under 5 square kilometers in size). Other communities which seem attractive places for walking, at least when compared to the region as a whole, are Annapolis, Lake Forest, and Coral Gables. Of course, traditional communities likely are most conducive to non-work walk trips, particularly for shopping and social-recreational purposes. If modal splits for these purposes were available, we would expect even more striking differences between community and regional averages.

Lastly, residents of traditional communities tended to enjoy shorter commutes than did the average worker in their respective metropolitan areas. This was so in seven of the ten communities shown in Table 6.2. In general, this likely reflects the tendency of residents from traditional towns to live relatively close to their workplaces and walk more often to work. Differences were less due to the use of automobiles for commuting since, as noted before, residents of traditional communities were roughly as auto-dependent as non-residents from the same region.

In summary, the study of these ten traditional communities suggests that their biggest mobility advantage lies in producing more walk and bicycle as well as shorter trips. Comparisons of non-work travel would likely be even more revealing.

3. Commuting in Edge Cities

In his 1991 book, *Edge City: Life on the New Frontier*, Joel Garreau identified some 75 Edge Cities across the U.S. — mega-concentrations of office complexes, retail malls, convention hotels, condominiums, and other enterprises, huddled in areas that only a decade or so earlier were farmland and sleepy suburbs. Most Edge Cities have densities and land-use mixtures that rival the downtowns of many medium-sized cities. Though unlike traditional downtowns that evolved gradually, many Edge Cities witnessed a tripling of commercial floorspace in a few short years during the building frenzy of the 1980s, swamping local arterials, schools, and water systems in the process. This led to suburban gridlock and grass-roots uprisings against new growth (Cervero, 1986, 1989). And unlike traditional downtowns, most Edge Cities were built primarily for automobile circulation. Many are distinctly unfriendly to walkers — laid out on a superblock scale, with squatty buildings surrounded by sprawling parking lots, and pierced by wide and busy boulevards, many of which are devoid of adjacent sidewalks.

How have transit and ridesharing fared in Edge Cities versus other places? Commute statistics gathered for 11 of them suggests it depends on the type of Edge City. Figure 6.2 shows that substantially higher shares of residents in five of six Edge Cities that had light, heavy, or commuter rail services commuted by transit in 1990 than did the typical suburbanite in each Edge City's respective metropolitan area. Nearly one-quarter of Silver Spring residents got to work by transit in 1990, compared to 10 percent of all suburban Washington, D.C. residents. Among residents of Twin Towers, a 315~unit apartment complex 900 feet from the Silver Spring Metro station, a 1989 survey by JHK & Associates found that 74 percent of residents commuted by transit each day; among those heading

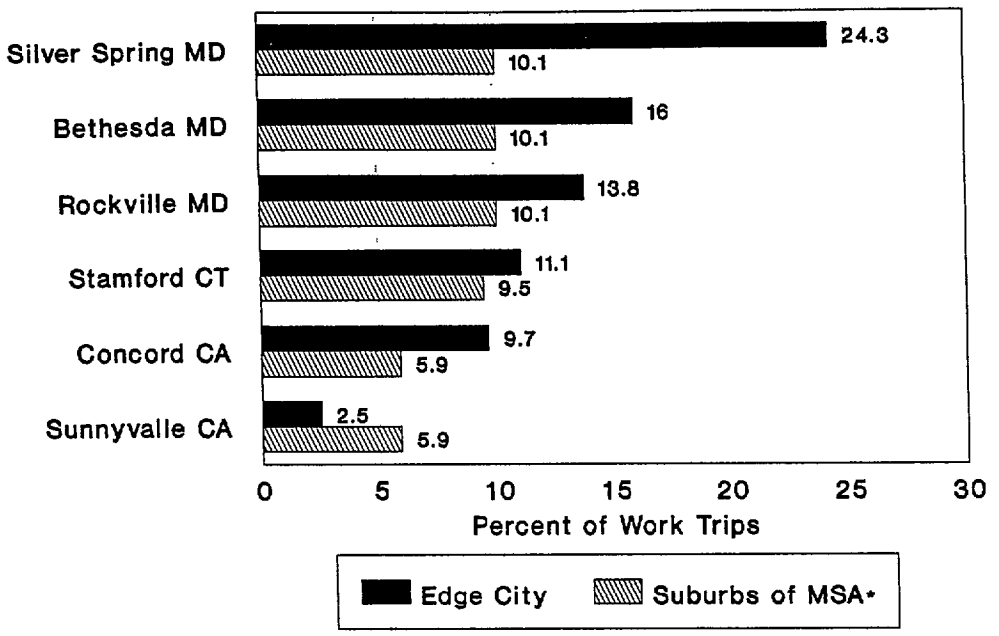


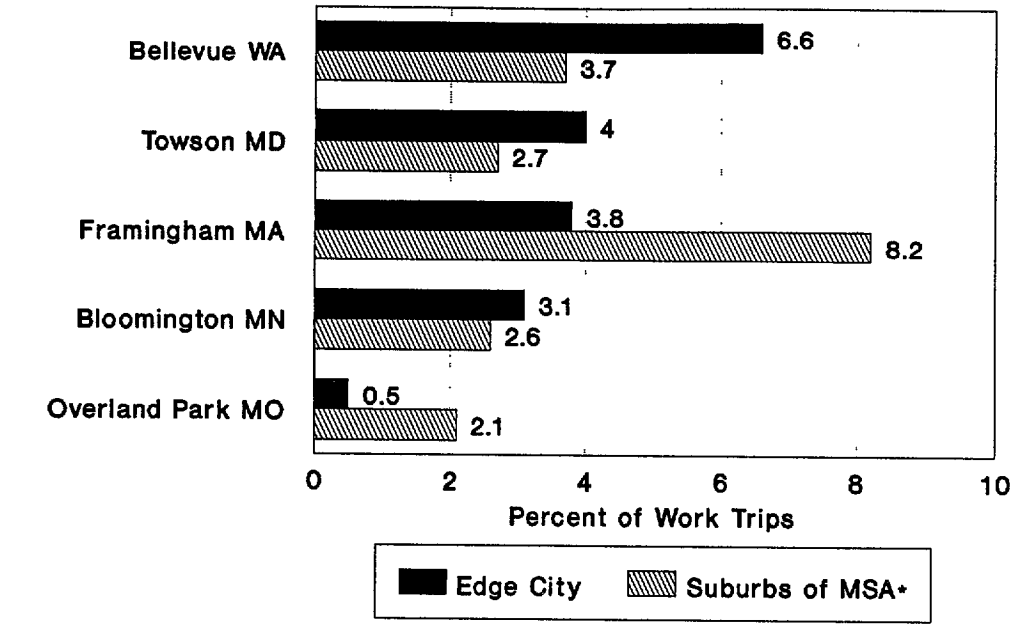
Figure 6.2

Comparison of Transit Share of Work Trips by Residents of Rail-Served Edge Cities and Surrounding Suburbs, 1990

to downtown Washington, 92 percent rode Metrorail. Those working in offices near the Silver Spring station were also prone to commute by transit— around one out of four got to work each day by rail or bus; for those workers coming from central Washington, D.C., over half commuted by Metrorail (JHK & Associates, 1989).

Among Edge Cities without rail services, transit was written off by the vast majority of commuters (Figure 6.3). Bellevue was the one exception, due in large part to the city's parking cap of 2 spaces per 1,000 square feet and mandatory parking charges imposed on several office towers built in the late 1980s as conditions of project approval. As discussed in Chapter Four, downtown Bellevue is also the Eastside's major transit hub, served by some two dozen buses operating on synchronized schedules during the weekday. While transit's market share of residents' commute trips was below the national average in the other four Edge Cities shown in Figure 6.3, in two of the four transit's share was still higher than that of surrounding suburbs. However, with regard to carpool and vanpool travel, Figure 6.4 shows that Edge Cities performed poorly compared to surrounding suburbs.

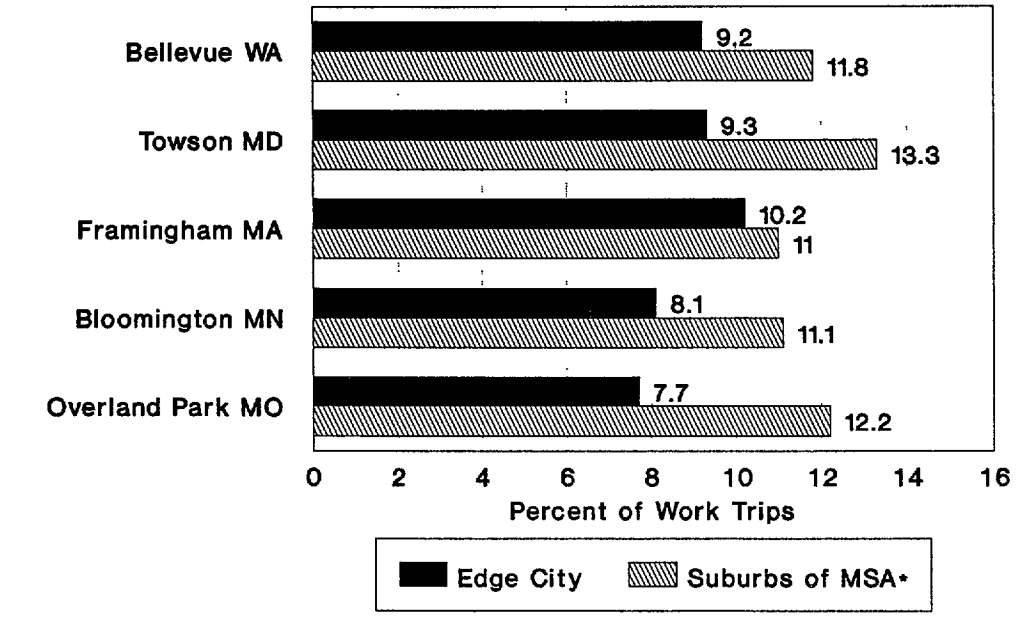
In summary, the relatively high densities and mixed land-use compositions of Edge Cities only seem to pay off if Edge Cities are served by rail transit. Where only bus services are available, roughly the same proportion of residents commute by transit, carpools, or vanpools in Edge Cities as in surrounding suburbs.



* Outside Central City of MSA

Figure 6.3

Comparison of Transit Share of Work Trips by Residents of Bus-Only Edge Cities and Surrounding Suburbs, 1990



* Outside Central City of MSA

Figure 6.4

Comparison of Carpool/Vanpool Share of Work Trips by Residents of Bus-Only Edge Cities and Surrounding Suburbs, 1990

4. Commuting Characteristics of Planned Versus Conventional American Communities

Master-planned communities provide two possible mobility advantages:

(1) they are usually planned for a balance of housing, retail, and sometimes even jobs (e.g., they are more self-sufficient and self-contained), and thus give rise to shorter trips within the community, especially more trips by foot and bicycle; and

(2) since they tend to be socio-demographically homogenous, have a critical mass of resident workers, and those working outside the community often commute to similar destinations, they are particularly well-suited for establishing successful carpools, vanpools, and subscription bus services.

If the above is true, these communities should have relatively high shares of non-SOV "alternative mode" trips — more walk, bike, ridesharing, and bus trips, at least compared to surrounding suburban communities. This section explores the degree to which these propositions hold, using *1990* journey-to-work statistics. For different types of planned communities, comparisons are drawn between the commuting characteristics of planned communities and nearby communities that are "less-planned."

4.1. Planned Communities in the U.S.

Many master-planned American communities, like Columbia, Maryland, and Reston, Virginia, were modeled after the Radburn, New Jersey, plan and British garden city concepts. The plans called for the development of self-contained communities that were insulated from many of the ills of inner-city living. Each would be surrounded by a protective greenbelt, giving the community a defined edge. Plans called for a hierarchy of roads to eliminate unwanted traffc through residential areas. Most traffic is routed around superblocks of a mile or more in circumference. Local traffic is slowed by the use of cul-de-sacs penetrating the superblocks from the perimeter roads. Housing is clustered around common open space. Linear greens and internal (sometimes grade-separated) pedestrian path systems connect neighborhoods. Each neighborhood is served by an elementary school and usually a small commercial center. In short, these were planned as nice, safe places for mostly middle-class Americans to raise their families.

Planned communities are hardly passe. Contrary to conventional wisdom, new communities did not die with the ill-fated HUD program3 of the 1970s, but rather fifty or more communities started since 1960 are still growing and expanding today, and at least fourteen new ones are in the wings (Avin, 1992; Ewing, 1991). From a survey of 58 new communities in the U.S., Ewing found that about half have populations above 10,000, and more than half are still being developed by their original master developers, a sign of financial viability.

Ewing argues that in the more difficult development climate of the 1990s new communities will fare better than typical suburban developments, especially small-scale subdivisions, because

master planning gives them an edge in terms of environmental sensitivity, fiscal self-sufficiency, and aesthetics. Specifically, they: are better able to preserve sensitive environments because of their scale and flexibility; provide more open space, recreation facilities, and amenities; produce somewhat reduced automobile travel because of their higher number of internalized trips and potentially greater transit use; have mixed uses and are large enough to support a diversity of housing; and are big enough to finance required infrastructure improvements more readily (e.g., through benefit assessment districts and bond financing) (Ewing, 1991; Avin, 1992).

Not everyone thinks so highly of the past 20 years of American new town planning. Neotraditionalists have been most vocal in their criticism. They have been particularly critical of: the use of multiple subcenters with no central focal point; large-scale subdividing of neighborhoods, interconnected by winding, curvilinear streets; strict separation of land uses, including housing types; and their insular quality, homogeneity, and "sterility."

In a recent article, Columbia's original chief architect-planner took issue with neotraditionalists' claim to be espousing something new:

> Columbia neighborhoods and villages, walkable scale, foot paths and sidewalks, narrow setbacks, generous open space, mix of uses, and strict design standards make it an early prototype for what is now being put forward as a brand-new concept in modern community design (Tennenbaum, 1990: 16.)

While new communities like Columbia and Reston do not always mix uses within neighborhoods, they certainly mix uses within villages. And while new towns tend to put pedestrians and cyclists on separate circulation paths, they clearly aim to accommodate foot and bicycle traffic nonetheless. The main difference in the neotraditional and new communities models has to do with scale and grain: neotraditional towns are built at a smaller scale, with more fine-grained (block-level) integration of uses and traffic streams, than new communities.

4.2. Earlier Studies on U.S. New Communities

Several researchers have compared master-planned communities with semi-planned, or less-planned, communities with regards to their levels of self-containment (e.g., jobs-housing balance) and transportation characteristics. Because many new communities contain both residential neighborhoods and employment centers, planners hoped they would have a relatively high proportion of persons who both live and work within the community. In a study of 13 plannedcommunities in the U.S., Zehner (1977) found little evidence that they were any more selfcontained. In fact, conventional (less-planned) communities had a slightly higher proportion of in-town workers (16 percent) than their new community counterparts (14 percent). Nonetheless, several new communities do stand out for their high levels of internalized commuting. Presently, about 40 percent of Reston's

resident workers are employed in Reston; in Columbia, the share is approximately 30 percent (Avin, 1992).

Studies differ in terms of whether master-planned communities average lower rates of VMT per capita than other suburban communities. Burby and Weiss (1976) concluded that new communities reduce auto trips by at least 7.5 percent over conventional communities, due in large part to shorter auto commuting and more walk trips. Lansing et al. (1970) found no overall difference in automobile usage — total miles driven and vehicle trips per family were roughly the same in planned and semi-planned communities. The researchers did show more walking in planned communities (7 of 10 people made daily walk trips) than in conventional, semi-planned ones (5 out of 10 people). The additional walking and bicycling trips, however, did not substitute for car use. Rather, they were supplemental.

4.3. Study of Self-Containment and Commuting Patterns for Three Classes of New Communities

Using data from the 1990 census, levels of self-containment and commuting patterns were further analyzed for nine new communities in the U.S. Table 6.3 profiles each of the nine communities. These planned communities were paired with "control" communities from the same metropolitan area to assess whether they were indeed more balanced and thus had different commuting characteristics than other nearby communities of similar size.

The following pairs of communities were studied:

Master-Planned	Conventional
Clear Lake City, TX	Friendswood, TX
Columbia, MD	Aspen Hill, MD
Irvine, CA	**Thousand Oaks, CA**
Las Colinas, TX	Colleyville, TX
Miami Lakes, FL	Lindgren Acres, FL
Mission Viejo, CA	Newport Beach, CA
Peachtree City, GA	Snellville, GA
Reston, VA	Dale City, VA
The Woodlands, Tx	Champions, TX

These communities were matched primarily on the basis of population size and median household incomes. The residential populations of five of the nine community pairs were within ten percent of each other; with one exception, median household incomes for all pairs were within eight percent of each other (Table 6.4). The median housing prices of new communities were also fairly similar to those of the control communities, and both tended to lie roughly the same distance from the regional CBD. Map 6.1 shows that all paired communities were located in the sunbelt crescent or mid-Atlantic.

Table 6.3

Profiles of Nine New Communities Studied

. *Clear Luke City, Texas,* home to roughly 40,000 persons, is one of several new communities in the Houston area planned by the Friendswood Development Company. Clear Lake City occupies a 15,000-acre site 20 miles southeast of downtown Houston. The community is adjacent to NASA's Johnson Space Center, which has spurred economic growth in high-tech fields and created a number of jobs in the area.

. *Columbia, Mary/and,* is probably the most well-known new community in the U.S. Opened in 1967 by James Rouse, Columbia sought to attract a diverse population in terms of income and race. While the ethnic mix of Columbia is more varied than most new communities, it has become a solidly upper-middle-class community. The development consists of a series of neighborhood villages organized around curvilinear street plans, complemented by the Columbia Town Center, which functions as the community's downtown. Columbia has over 75,000 residents; some 43,000 people work in the community. The city lies midway between Washington, D.C., and Baltimore, Maryland, on approximately 15,000 acres of land.

. *Irvine, California,* is by far the largest new community in the survey in terms of population, jobs, and physical size. The city covers 27,000 acres about 40 miles southeast of downtown Los Angeles in rapidly growing Orange County. Initially developed by the Irvine Company on the site of a former ranch, Irvine became an incorporated city in 1971. Today, Irvine has a population of over 110,000 and in excess of 152,000 jobs. In addition to its sheer size, Irvine is notable for its well-developed network of pedestrian and cyclist pathways, which is reflected in the relatively high proportion of Irvine residents who walk to work.

• Las Colinas, *Texas,* lies on a 12,000-acre site within the city of Irving, Texas, about 15 miles northwest of downtown Dallas. The development abuts several local freeways and lies next to the bustling Dallas/Fort Worth International Airport, which has influenced the relocation of some 900 companies to the development since it opened in the mid-1970s. The number of jobs in the community, approximately 50,000 in 1990, dwarfs its residential population of about 12,000. In contrast to the other new communities in this survey, Las Colinas residents are primarily renters, perhaps because single-family housing has been targeted to upper-income families.

. *Miami Lakes, Florida,* is a 3,000-acre development in northwest Dade County, some 20 miles north of downtown Miami. The site was developed by The Graham Companies and opened to its first residents in 1962. This unincorporated community's main residential amenity is its 22 manmade lakes; its most noted commercial feature is its Town Center, a mixed-use, moderatedensity sector at the center of the development which adheres to many of the design features advocated by neotraditional town planners. The community's main employment centers are its two business parks, located at the eastern and western edges of the development. Approximately 10,000 persons work in Miami Lakes.

• *Mission Viejo California,* is a city of 73,000 persons about 50 miles southeast of downtown Los Angeles. Like nearby Irvine, the city is built on the site of a large ranch in suburban Orange County. Originally developed by a subsidiary of the Philip Morris Corporation, the community incorporated in 1988. The city estimates that nearly 17,000 people work within its borders.

• *Peachtree City, Geogia,* is located 30 miles southwest of downtown Atlanta on a 15,000-acre site developed by the Peachtree City Development Corporation and its predecessors. Peachtree City is an incorporated city and has been since 1959, fully one year before the development officially opened. Peachtree City's distance from a major freeway-12 miles — has been a liability for attracting employers. While the city has a 2,200-acre business park, the majority of its residents are employed in downtown Atlanta or at Hartsfield International Airport. The airport, one of the nation's busiest, was the primary factor behind the city's growth through the 1980s.

• *Reston, Virginia,* occupies a 10,000-acre site in Fairfax County, Virginia, about 18 miles northwest of Washington, D.C. The development opened in 1964 and, like Columbia, was designed to accommodate a residential population of varied economic and ethnic backgrounds, a goal which has had only limited success. Like Columbia, the community is organized around a number of residential villages, which are served by a neotraditional town center currently being developed. Reston's growth was hampered in its early years due to the financial difficulties of its initial developer and its lack of access to the nearby Dulles Access Road. These problems were eventually resolved, and today the community boasts a population of about 40,000 and an employment base of approximately 31,500.

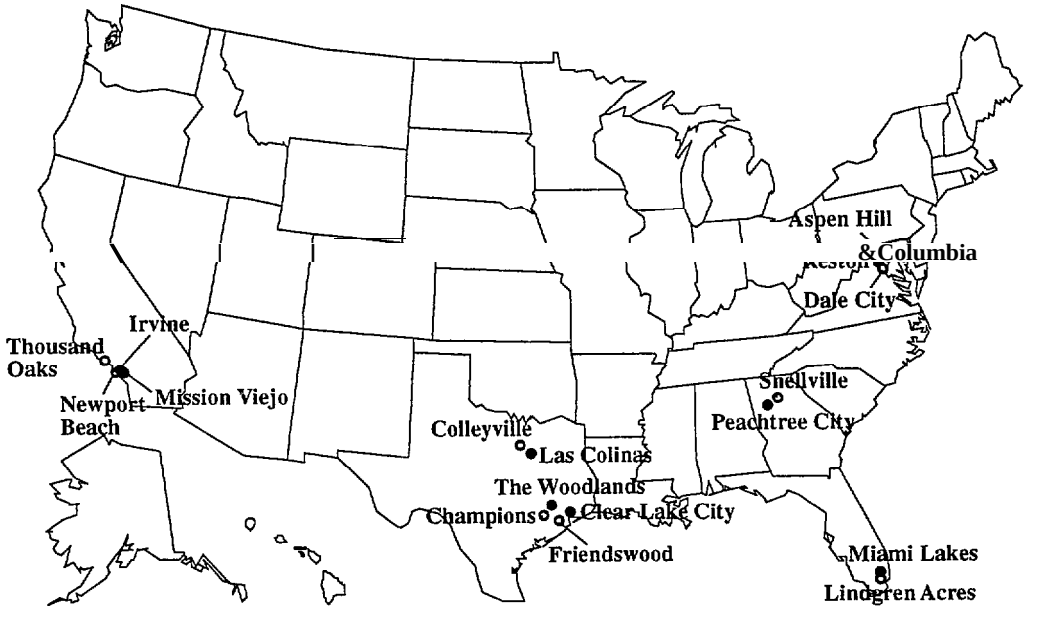
• *The Woodlands, Texas,* is an unincorporated community about 30 miles north of Houston. It was developed by local oilman George Mitchell and continues to be run by a subsidiary of the Mitchell Energy Corporation. The Woodlands, like other master-planned communities in the Houston area, enjoyed strong home sales during the 1980s' downturn in oil prices that negatively affected the region's economy. The community's high level of amenities offered reassuring stability in contrast to the neighborhoods of Houston proper, which remained unprotected by traditional zoning laws. Today, The Woodlands has a population of nearly 30,000 and is home to some 7,000 full-time jobs. Economically, it benefits from its proximity to Houston's major airport. The recent opening of a toll highway provides a fairly uncongested link to downtown Houston.

Table 6.4

Profile of Survey Communities

	Pop.	Median Hhd. Income	Median rent	Median home value	Distance from CBD (miles)
Balanced Communities					
Columbia	***75,883***	***$55,419***	***$726***	***$150,900***	***22***
Aspen Hill	45,494	$152,645	$798	$187,200	14
Reston	***48,556***	***$56,884***	***$818***	***$198,100***	***18***
Dale City	47,170	$50,940	$845	$121,600	23
Miami Lakes	***12,750***	***$45,455***	***$670***	***$137,100***	***21***
Lindgren Acres	22,290	$46,159	$817	$101,500	24
Residential Communities					
Clear Lake City	***39,601***	***$47,076***	***$595***	***$90,220***	***20***
Friendswood	22,814	$50,492	$607	$82,300	20
Mission Viejo	***72,820***	***$61,058***	***$969***	***$252,100***	***50***
Newport Beach	66,643	$60,374	$967	$500,001	45
The Woodlands	***29,205***	***$50,929***	***$531***	***$100,400***	***29***
Champions	26,262	$152,147	$486	$121,625	19
Peachtree City	***19,027***	***$53,524***	***$691***	***$118,200***	***30***
Snellville	12,084	$146,875	$616	$96,300	23
Employment Centers					
Irvine	***110,330***	***$56,307***	***$925***	***$292,600***	***36***
Thousand Oaks	104,352	$56,856	$899	$295,800	37
Las Colinas	***12,365***	***$44,733***	***$599***	***$311,233***	***12***
Colleyville	12,724	$77,530	$647	$189,300	20

Source: U.S. Bureau of the Census, 1990



Key:
- ● New Communities
- 0 Comparison Communities

Map 6.1

New and Comparison Communities

Classes of New Communities

Based on their ratios of jobs to workers, new communities were further broken into three classes: (1) Balanced Communities (Columbia, Reston, and Miami Lakes); (2) Residential Communities (Clear Lake City, MissionViejo, The Woodlands, and Peachtree City); and (3) Employment Centers (Irvine and Las Colinas). Table 6.5 shows that the Balanced Communities had ratios of jobs-to-

Table 6.5

Density and Population-Employment Balance Characteristics of Planned Communities and Conventional Communities, 1990

	Population density (persons/sq. km.)	Housing density tslacre)	Jobs/workers ratio	Jobs/housing ratio
Balanced Communities				
Columbia	***1,262***	***2.07***	***0.93***	***2.40***
Aspen Hill	1,679	2.57	0.23	0.37
Reston	***1,088***	***1.82***	***1.04***	***1.58***
Dale City	1,200	1.58	0.23	0.39
Miami Lakes	***2,247***	***2.40***	***1.31***	***1.66***
Lindgren Acres	2,291	3.44	0.08	0.12
Residential Communities				
Clear Lake City	***630***	***1.10***	***0.65***	***0.88***
Friendswood	425	0.61	0.21	0.31
Mission Viejo	***1,611***	***2.37***	***0.43***	***0.64***
Newport Beach	1,836	3.90	1.27	1.43
The Woodlands	***689***	***1.09***	***0.51***	***0.61***
Champions	346	0.60	0.84	1.08
Peachtree City	***315***	***0.44***	***0.35***	***0.46***
Snellville	511	0.72	0.49	0.72
Employment Centers				
Irvine	***1,007***	***1.57***	***2.47***	***3.60***
Thousand Oaks	813	1.20	0.53	0.79
Las Colinas	***423***	***0.71***	***6.08***	***20.03***
Colleyville	375	0.52	0.35	0.53

Source: U.S. Bureau of the Census, 1990

resident workers in the 0.93-1.31 range and ratios of jobs to housing units in the 1.58-1.66 range4 They also tend to be denser than other new communities. Part of the reason Columbia, Reston, and Miami Lakes rank as balanced communities is that they have relatively new mixed-use town centers. In Reston's case, the core was transformed over the past decade from a neighborhood commercial complex to a major regional employment and retail center, complete with a main street lined with ground-floor shops, restaurants, and even homes above businesses.

Residential Communities are just that — principally places to reside, averaging jobs-to-resident worker ratios between 0.35 and 0.65. Although each of these places contains some commer-

cial uses, they are principally know for their residential concentrations. And the two employment centers, Irvine and Las Colinas, have jobs-to-resident worker ratios well above 2.00. These two new communities are home to many large corporations and businesses.

Table 6.6 shows that differences in ratios of jobs-to-resident workers and jobs-to-housing among the three classes of communities were statistically significant. Table 6.7 shows planned communities were also significantly more balanced, on average, than conventional ones.

Table 6.6

Mean Differences in Jobs-Housing Balance, Modal Splits, and Commute Times Between Classes of Planned U.S. Communities, 1990

	Balanced Communities	Residential Communities	Employment Communities	ANOVA Statistics F	Significance	Eta-Squared
Jobs/Resident-Workers Ratio	1.09	0.48	4.27	9.04	.015	.751
Jobs/Housing Ratio	1.54	0.64	6.80	7.70	.022	.719
Percent Commute Trips by:						
Drive-alone	80.33	82.02	82.64	0.28	.769	.085
Carpool/Vanpool	14.68	15.31	13.90	0.86	.521	,140
Transit	3.47	1.71	0.87	1.25	.350	.295
Walk/Bike	1.52	0.96	2.59	5.05	.051	,627
Commute Time (minutes)	26.24	26.98	20.83	2.44	.167	.449

Table 6.7

Matched-Pair Differences in Mean Jobs-Housing Balance, Modal Splits, and Commute Times Between Planned and Conventional U.S. Communities, 1990

	Planned Communities	Conventional Communities	Matched-Pair Test T-Statistic	Significance
Jobs/Resident-Workers Ratio	1.83	0.38	1.64	.140
Jobs/Housing Ratio	1.02	0.19	1.61	.147
Percent Commute Trips by:				
Drive-alone	81.60	80.52	0.59	.571
Carpool/Vanpool	14.88	15.50	0.60	.555
Transit	2.11	2.47	0.30	.727
Walk/Bike	1.41	1.51	0.23	.815
Commute Time (minutes)	25.32	29.23	2.04	.076

From a mobility standpoint, Balanced Communities could be expected to have relatively large shares of walking and bicycling trips, and relatively short average commutes- relative to both the "control" communities and other classes of new towns. Residential communities, on the other hand, are characterized by more out-commuting; because Vanpools and subscription buses

are easier to organize in these settings, it might be expected that they average relatively high rates of ridesharing and perhaps transit usage. And employment centers are places with lots of in-commuting — and perhaps also relatively high rates of ridesharing and mass transit trip-making.

Comparison of Commuting Characteristics

(A) Modal Splits

In 1990, six of the nine planned communities had higher shares of residents commuting by transit than conventional communities (Table 6.8), though differences were not statistically signifi-

Table 6.8

Comparison of Commuting Statistics for New Communities and Conventional Communities, 1990

	Percent of trips				Mean commute
	Drove Alone	Carpool	Transit	Walked	time (mins.)
Balanced Communities					
Columbia	***19.6***	***12.1***	***3.37***	***1.29***	***28.1***
Aspen Hill	70.1	14.7	10.90	8.13	30.4
Reston	***75.7***	***12.8***	***5.86***	***1.87***	***27.0***
Dale City	65.7	28.1	2.74	0.77	40.8
Miami Lakes	***85.7***	***9.2***	***1.19***	***1.40***	***23.5***
Lindgren Acres	84.3	8.8	2.68	1.17	29.2
Residential Communities					
Clear Lake City	***83.3***	***9.7***	***1.65***	***1.88***	***22.0***
Friendswood	85.0	9.7	0.82	0.93	30.4
Mission Viejo	***82.4***	***10.9***	***0.59***	***1.02***	***29.1***
Newport Beach	83.8	6.2	0.91	2.21	23.1
The Woodlands	***77.6***	***12.4***	***4.44***	***0.81***	***30.5***
Champions	81.8	9.3	3.49	1.51	28.2
Peachtree City	***84.7***	***9.8***	***0.16***	***0.15***	***26.1***
Snellville	87.4	9.2	0.00	0.76	30.1
Employment Centers					
Irvine	***81.9***	***9.1***	***0.60***	***3.02***	***23.2***
Thousand Oaks	80.9	11.3	0.32	1.79	26.9
Las Colina	***83.3***	***11.0***	***1.15***	***2.26***	***18.4***
Colleyville	85.9	7.1	0.36	0.43	23.8

Source: U.S. Bureau of the Census, 1990

cant (Table *6.7*). In general, Balanced Communities had the highest rate of transit commuting (Table *6.6*). Only in Reston did more than 5 percent of the working population use mass transit to get to work. Next highest was The Woodlands — *4.4* percent. Both of these communities have commuter bus runs to the downtown cores of their respective metropolitan areas (Washington, D.C., and Houston, Texas). These two communities also had among the highest incidences of car-

pooling and vanpooling among new towns, though in the case of Reston, its comparison community, Dale City, had twice the share of commuters sharing rides.

Drive-alone commuting was the dominant commuting means in all new towns- as high as *85* percent in Miami Lakes and Peachtree City. In all three Balanced New Communities, larger shares of residents solo-commuted than in the conventional communities. However, for the four Residential New Communities, the opposite held — larger shares of residents solo-commuted in the conventional communities. Thus, planned communities with a strong residential orientation were less dependent on autos, relative to their close-by "control" communities, than any other class of communities.

The only new communities with significant shares of walking and bicycling commute trips were the two Employment Center New Communities Irvine and Las Colinas. For both communities, shares of walk and bicycle commutes were about 1.5 percentage points higher than in the comparison communities, and shares were also larger than in any of the seven other new communities studied. Thus, contrary to what might be expected, new communities with a strong employment orientation had larger proportion of residents walking to work than did balanced communities (Table *6.6).* Of course, the biggest impact of self-containment probably relates more to non-work trips, such as for shopping, social-recreation, and personal business. For these purposes, balanced communities could very well have significantly higher shares of foot and bicycle travel.

In general, the same relationships existed in 1980 as well. Table 6.9 shows that Balanced Communities also had a higher rate of non-SOV travel relative to other classes of new towns in 1980, though rates were similar for the control communities. Higher shares of Balanced Community residents also walked to work in 1980 than in 1990.

(2) Trip Generation Rates

Comparable numbers of vehicle trips per acre (and per dwelling unit) were generated in planned communities and control communities, as well as across classes of new communities, for both 1980 and 1990. (See Tables A6.1 through A6.4 in the Appendix.) Trip generation rates nearly doubled in all communities studied during the 1980s, reflecting healthy rates of population and employment growth.

(3) Travel Time

The most striking relationships were in terms of mean commute times. For seven of the nine planned communities, average commute times were less than those of the control communities, in both 1980 and 1990 (Tables 6.8 and 6.9). The only exceptions in 1990 were Mission Viejo and The Woodlands, both of which are located at the extreme edge of their metropolitan areas. The average travel time to work for all new communities was 25.3 minutes; for conventional communities the average was 29.2 minutes (Table 6.7).

Table 6.9

Comparison of Commuting Statistics for New Commuuities and Conventional Communities, 1980

	Percent of trips				Mean Commute
	Drove Alone	Carpool	Transit	Walked	Time (mins.)
Balanced Communities					
Columbia	***64.9***	***24.7***	***5.55***	***2.19***	***29.2***
Aspen Hill	63.6	24.0	7.57	1.88	28.9
Reston	***59.6***	***23.4***	***10.50***	***3.84***	***32.6***
Dale City	49.7	42.3	4.58	1.02	37.8
Miami Lakes	***80.4***	***15.5***	***0.53***	***1.12***	***21.9***
Lindgren Acres	71.6	23.8	1.44	0.31	26.9
Residential Communities					
Clear Lake City	***72.0***	***23.1***	***0.23***	***1.59***	***23.3***
Friendswood	75.9	19.6	0.00	1.22	27.8
Mission Viejo	***77.1***	***17.0***	***1.64***	***0.74***	***27.8***
Newport Beach	80.3	9.1	1.56	3.03	23.0
The Woodlands	***76.8***	***18.1***	***0.33***	***1.44***	***30.6***
Champions	70.3	21.4	4.08	1.61	32.2
Peachtree City	***74.3***	***26.1***	***0.00***	***0.28***	***25.6***
Snellville	69.5	27.2	0.87	0.15	32.3
Employment Centers					
Irvine	***80.4***	***12.0***	***1.46***	***1.72***	***23.4***
Thousand Oaks	74.2	19.5	0.52	1.82	27.0
Las Colinas	***75.1***	***17.8***	***0.50***	***4.11***	***15.2***
Colleyville	79.3	15.5	0.34	2.49	23.4

Source: U.S. Bureau of the Census, 1980

Residents of Balanced Communities, in particular, got to work faster than those of nearby conventional communities. Columbia residents reached work, on average, about two minutes faster than their counterparts in Aspen Hill. In Reston, the average travel time to work of 27 minutes was nearly 14 minutes faster than that of workers in Dale City, who on average endured commutes of 40.8 minutes.

The shortest commutes were found in communities with a surplus of jobs. The community with the fastest average commute — 18.4 minutes — was Las Colinas, the only community in the survey where residents enjoyed an average commute under 20 minutes. (All but two of the surveyed communities averaged commutes above the 1990 national average of 22.4 minutes.) Las Colinas has the highest jobs-to-worker ratio of all the surveyed communities- over six jobs for every resident worker. The next shortest commutes were by Irvine and Miami Lakes residents, in which, like Las Colinas, the number of jobs exceeded the number of resident workers. These figures imply that residents of these communities are perhaps able to find work in close proximity to their homes

and thus enjoy brief commutes. Indeed, Las Colinas had the highest proportion of in-town workers of any of the communities surveyed, approximately 38 percent. Irvine was a close second, with just over 37 percent of its employed residents working within the city.

Overall, the share of in-town workers ranged from 4.6 percent in The Woodlands to 38.5 percent in Las Colinas; in the conventional cities it ranged from 3.9 percent in Lindgren Acres to 38.9 percent in Thousand Oaks. The average share of in-town workers for the new communities, 24.9 percent, was substantially higher than the 18.7 percent figure for their conventional pairs.

Recap

New communities vary considerably with regards to ratios of jobs to housing. Regardless whether these communities have a job or housing surplus, significantly larger shares of residents of planned communities have local jobs relative to conventional communities. This gets translated into comparatively short trips. The shortest trips are in the communities with the largest job surplus. Though new communities appear to be more self-contained than most other suburban towns, commuters nonetheless seem to be as auto-reliant as in any other community. Balanced Communities had the highest shares of transit trips whereas job-surplus communities had the highest shares of walk trips. Since non-SOV modals splits tended to be higher in planned communities than conventional ones, regardless of community type, we can infer that master-planning has some positive influence on encouraging commute alternatives to the automobile.

5. Planned Communities and Commuting in Great Britain

5.1. Generations of New Towns in Great Britain

Great Britain has a long history of successful new town planning, and is thus a natural place to begin looking for comparative international insights. This section concentrates on some of the transportation and mobility implications of 23 new communities built in England since 1946 under the direction of the central government (Map 6.2).[5] The very first new towns owe much to the visionary garden-city concepts of Ebenezer Howard. Garden cities were meant as antidotes to the impoverished and filthy conditions of inner-city living in Victorian England. According to Hall (1988: 8):

> It proposed to solve, or at least to ameliorate the problem of the Victorian city by exporting a goodly proportion of its people and its jobs to new, self-contained, constellations of new towns built in open countryside, far from the slums and smoke — and, most importantly, from the overblown land values- of the giant city.

Three garden-city new towns, Letchworth, Hampstead, and Welwyn, were built in the early 1900s by private investors. Designed by two pioneering planner-architects, Raymond Unwin and Barry Parker, all three were more like garden suburbs, featuring clustered housing grouped around

Source: Watson (1991)

Map 6.2

New Towns in England: 1946-1970

communual greens and connected by pedestrian ways — nearly a quarter century before the Radburn Plan.

The depression of the 1930s and second world war stalled the British new town movement, though it pick up momentum after the war, owing to the need to replace housing in wartorn areas. Sir Patrick Abercrombie's 1944 outline plan for Greater London recommended the creation of new "satellite" towns, close enough to London to act as "overspill" areas but sufficiently removed from the capital to avoid becoming domitory towns (Watson, 1991). The New Towns Bill of 1946 followed,

authorizing the establishment of Development Corporations to plan, build, and finance new towns. Between 1946 and 1950, eight new towns, referred to chronologically as Mark I towns, were built 20 to 30 miles from London, functioning as Abercrombie's recommended satellites for handling London's spillover growth.6 Mark I towns were planned on the assumption that most people would reach their jobs on foot or bicycle and that auto ownership would be low (Dupree, 1987). Thus, all feature separate footpath and cycleways, narrow streets, and residential areas buffered from major thoroughfares. Mark I towns were segregated into functional land uses, with residential areas clustered into neighborhood units for about 10,000 people focused on retail centers. With low population densities and spatial separateness, sociologist found many inhabitants of this first-generation of British new towns were lonely and isolated, suffering from "new town blues" (Ward, 1993).

During the 1950s, enthusiasm for new towns waned in Great Britain because political priorities had shifted. Rising unemployment in central and northern England, however, led to a new generation of new town development, Mark II towns, during the 1960s. While these new communities were meant to provide for the orderly spillover of people from large cities, their primary purpose was to act as instruments for regional policy— mainly to disperse industry and population from conurbations in the Midlands and the North as well as the Southeast, and, in so doing, to spawn new centers of economic development. Thus, Mark II new towns were distinguishable from their predecessors in that they were outside of London's orbit and they tended to be much larger!

Prom an urban design standpoint, two key factors shaped Mark II towns. One, concern over the "new town blues" syndrome of Mark I communities led to the development of larger, denser Mark II towns, to help foster "community identity." Cumernauld was the first new town designed expressly as a compact community, with a target population of 100,000. The second decisive factor was the issuance of the highly influential publication, *Traffic in Towns*, also called the Buchanan report, in 1963. This document articulated the need to plan for a distinct road hierarchy and the careful arrangement of land uses to handle the anticipated explosive growth in motorization (Potter, 1984). This led to plans for Redditch, Runcorn, and Washington that emphasized segregation of pedestrians and fast-moving traffic and the dispersal of land uses with high traffic generation to ensure balanced peak hour flows.

The last generation of British new town development occurred in the late 1960s and early 1970s with the construction of six Mark III towns? All were built well beyond the periphery of London, and were targeted as sub-regional centers with populations of at least 150,000. Two of the towns, Peterborough and Northamption, were already well-established centers, while Milton Keynes was created in an area with relatively little previous development. Mark III new towns carried on the tradition of building highway infrastructure necessary to accommodate the exploding car population, though more to an extreme. Milton Keynes is unabashedly an auto-oriented community, crisscrossed by a grid of four-lane thoroughfares that are grade-separated at major junctures. The largest and

last of the English new towns, Milton Keynes was designed with generous amounts of open space and highway capacity, a testament to the population and automobile growth that was envisaged.

In the past few years, British new town development has ground to a halt as policy interest has shifted to regeneration of inner cities. The wind-up of the Telford Development Corporation in 1991 and the Milton Keynes Development Corporation in 1992 brought a major chapter in the planning of urban development in England to a close. In the next several sections, lessons that might be drawn on the transportation implications of British new town development are drawn.

5.2. British New Towns, Self-Containment, and Commuting

According to Thomas (1968, p. 338) all British new towns were designed with the idea that they should be "self-contained and balanced communities for living and work." Three groups of researchers, Thomas (1968), Cresswell and Thomas (1972), and Breheny (1990), have tested this proposition, and their collective findings are summarized in Table 6.10.10

Table 6.10 shows the "Independence Index" values of each new town over the 1951-1981 period — a measure, created by Thomas (1968), of internal work trips divided by the sum of in and out (external) work trips. The higher the index value, the higher share of all work trips that are internal and lower the share that cross community boundaries i.e., the more self-contained the community.

The most self-sufficient British new towns are clearly those most recently built- Mark III towns. Rather curiously, then, the British new towns with the greatest provisions for automobility are the ones with the largest share of commuters traveling within their borders. This is likely partly explained by the relative isolation of many Mark III towns (e.g., surrounded by greenfields) and the emphasis placed on regional economic development (wherein housing priority was given to those working within the community).

Table 6.10 shows that the planned overspill communities around London (Mark I) became increasingly self-contained over their first 10 to 20 year of existence, though by the 1970s their residents were increasingly dependent on the hinterland for jobs and their businesses imported more and more workers. By 1966, five out of eight London orbital new towns were net importers of labor (Thomas, 1968). The 1961-66 peak period of self-containment was also when these early new towns began to reach their planned capacity, but before significant growth in car ownership. Thomas (1968) and Creswell and Thomas (1972) also compared independence indices between new towns and "natural," or control, towns. For 1966, they calculated an average independent index for natural towns of 1.04, substantially below that of new towns1 1 They attributed the higher level of locally residing workers to two key factors: the policy of Development Corporations to place those working within the community at the top of the waiting list for new housing, and the entry of women (who

Table 6.10

Work Trip "Independence Index" Values for British New Towns, 1951-1981

	1951	1961	1966	1971	1981
MARK1					
London's Orbit:					
Stevenage	0.92	2.29	2.03	1.63	1.14
Crawley	0.98	1.59	1.58	1.69	1.15
Hemel Hempstead	1.31	1.82	1.72	1.43	1.00
Harlow	1.42	2.04	2.05	1.92	1.44
Hatfield	0.65	0.63	0.66	0.32	0.45
Welwyn	1.12	1.09	1.12	0.97	0.68
Basildon	0.36	0.96	0.96	0.87	0.76
Bracknell	0.90	1.13	1.02	0.87	0.82
Average	0.96	1.44	1.39	1.21	0.93
Other:					
Aycliffe	**0.08**	0.52	0.57	0.44	0.74
Peterlee	0.34	0.20	0.36	0.41	0.34
Cwmban	0.72	0.74	0.88	0.75	0.86
Corby	1.41	1.91	2.51	0.69**	1.79
Average	0.64	0.84	1.08	0.57	0.93
MARK II					
Compact-Transit:					
Skelmersdale	*	*	*	0.67	0.87
Redditch	*	*	*	1.30	1.12
Runcorne	*	*	*	0.73	0.94
Average	*	*	*	0.90	0.98
Full Mobility:					
Washington	*	*	*	0.56	0.67
Newtown	*	*	*	1.03	1.32
Average	*	*	*	0.80	1.00
MARKIII					
Milton Keynes	*	*	*	1.36	1.44
Petersborough	*	*	*	1.84	1.99
Telford	*	*	*	2.61	2.41
Northampton	*	*	*	2.88	2.43
Warrington	*	*	*	1.74	1.32
Central Lancaster	*	*	*	1.88	1.88
Average	*	*	*	2.05	1.91
MARK I NEW TOWNS ***	0.85	1.24	1.29	1.00	0.95
ALL NEW TOWNS ****	0.85	1.24	1.29	1.24	1.20

*** Figures not reported by any of the below sources.**
**** Reported by Breheny (1990), though value is suspicious** compared to 1966 and 1981 values.
***** Average for those 12 new towns (Mark I) for which values are available for all years.**
****** For all 23 new towns, for years data are available.**
Note: All averages are not weighted by population.
Sources: 1951,1961, and 1966 figures are from Thomas (1968) and Cresswell and Thomas (1972), and also reported in Breheny (1990). 1971 and 1981 figures are from Breheny (1990).

at the time were less likely to drive) into the labor force. The authors also showed that self-containment generally increased with distance from London and town size?2

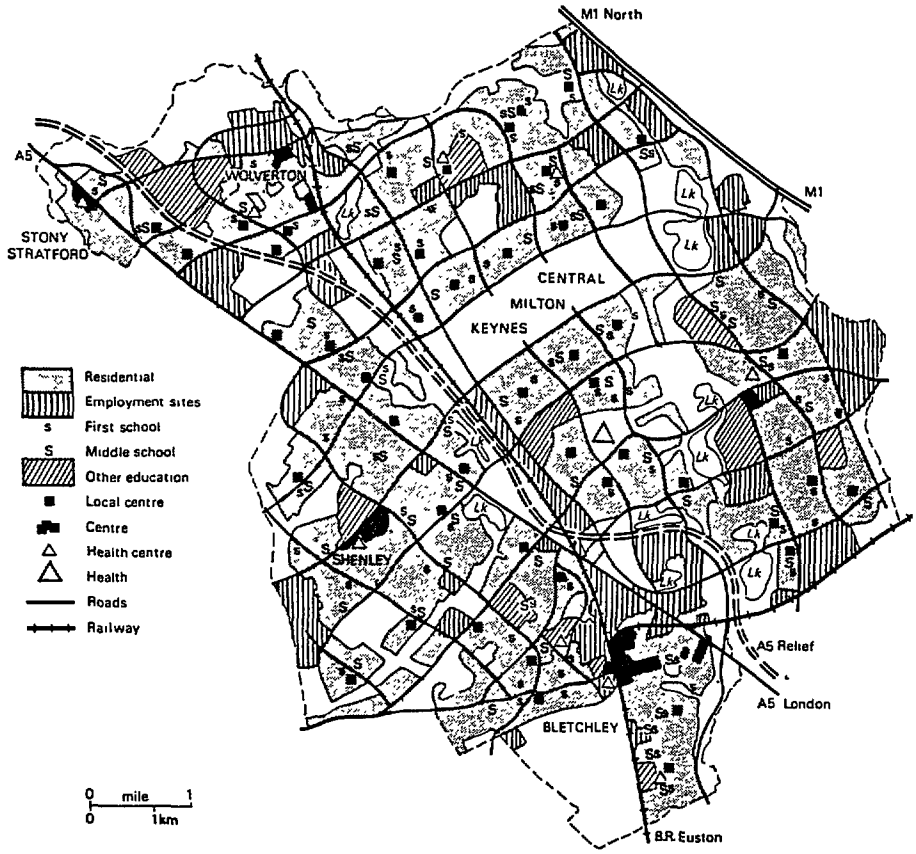
Except for Mark III towns, independence indices are fairly similar among classes of new towns. Among Mark I towns, for instance, those surrounding London appeared more self-contained than those elsewhere in Great Britain from 1951 to 1971, but by 1981 they had equal shares of external commuting. Mark I towns were slightly more self-contained than their Mark II successors in 1971, but a decade later the opposite was true. Nor does there appear to be significant differences between the earlier Mark II new towns that were compact and designed for high-quality transit and the latter full-mobility new towns (Washington and Newtown).

Breheny (1990) in updating the Cresswell and Thomas work to 1981, concludes that in both new towns and other towns, self-containment has declined and that the decline has been greater in the new towns than in the "natural towns."13 He attributes this decline mainly to rapid increases in vehicle ownership, leading to the "breakdown of the original 'job and home' function of the new towns" (Breheny et al., 1992: 151). While perhaps true, this does not accurately portray recent trends. As noted, the latest new towns, Mark III communities, are all highly self-contained, which when averaged over the totality of the *23* new towns shown in Table 6.10 yields an average 1981 independence index which is similar to that found in 1961. More accurately, during the 1951-81 period, the trend seems to be that as they matured, Mark I new towns indeed became less self-contained, whereas the later generation of new towns maintained high levels of self-containment — Mark II actually became more balanced and Mark III new towns became the most balanced of all.

These findings probably speak less to any influences of physical design or urban planning and more to the relative location (away from England's primate city, London) of more recent new towns. Indeed, all researchers showed that levels of self-sufficiency increased with distance from London and the remoteness of the community.

5.3. Urban Form and Commuting in British New Towns

Potter (1982, 1984) has brought the impacts of auto-oriened versus transit-oriented British new towns into clear focus. Milton Keynes (Map 6.3) was purposefully designed to maximize automobility — it has low average densities (9 persons per acre) organized around a grid of four-lane thoroughfares and a random distribution of destinations to spread vehicle loading on roads over as wide an area as possible. In contrast, Runcorn, outside of Liverpool, has separate facilities for bus and car traffic. Buses operate on a figure eight track that threads its way through the center of residential neighborhoods and connects directly to the town center (Map 6.4). Runcorn's planner-designer, Arthur Ling (1967, p. 18), argued that:



Source: Potter (1982)

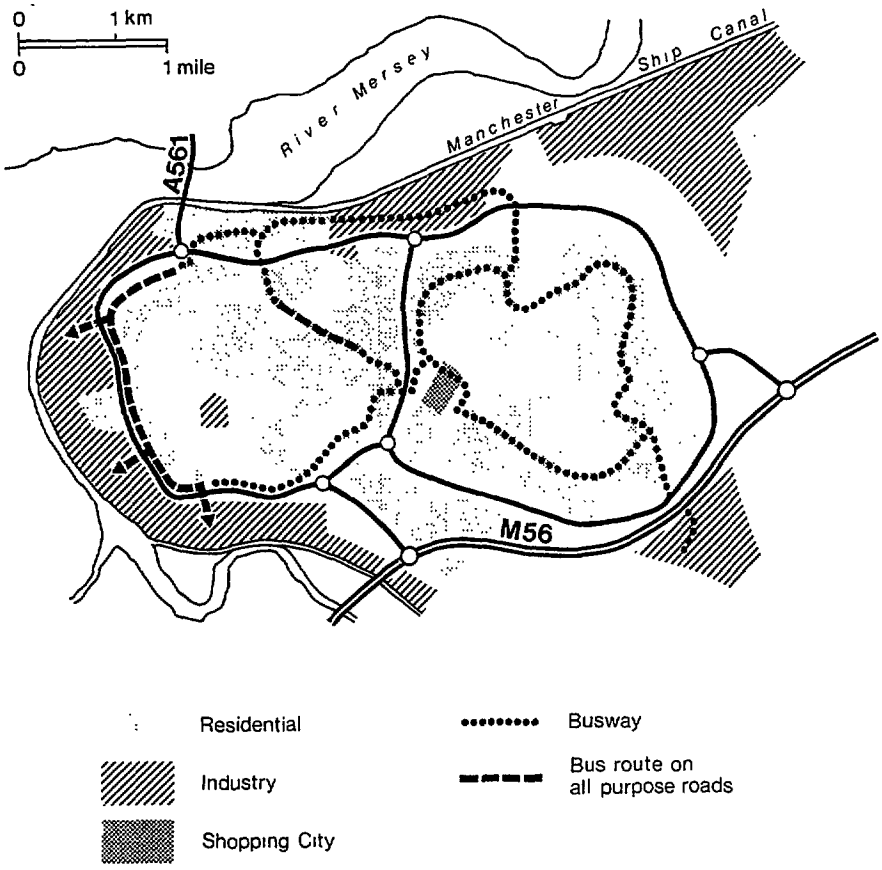
Map 6.3

Strategic Plan of Milton Keynes, 1984

> To design the town dominantly for the motor car would require maximum expenditure on highways to cater for peak-period traffic and a more extensive provision of car parking spaces at the Town Centre and in the industrial areas. In addition, public transport ... would be little used and therefore it would be uneconomic to operate a frequent service. This would cause a sense of social isolation for those without the use of a car, such as children and old people, and also members of the family to whom the car is not available at a particular time. (Quoted in Potter, 1984, p. 81).

On this basis, Ling proceeded to design Runcorn's residences at sufficient densities and in defined corridors to justify frequent bus services. This "pearls on a string" design ensured balanced two-way bus flows.

Table 6.11 summarizes Potter's comparison of Milton Keynes with Runcorn and another transit-oriented new town, Redditch.[14] Although the original Milton Keynes plan called for frequent transit service (2-5 minute headways), once the auto-dependent, low-density community was built, planners realized that frequent transit services would be prohibitively expensive.[15]



Source: Dupree (1987)

Map 6.4

Runcorn's Busway System, 1968

Table 6.11

Comparison of Physical and Transportation Characteristics of Milton Keynes, Runcorn, and Redditch, 1982

	Milton Keynes	Runcorn	Redditch
Physical Characteristics:			
Year of Designation	1967	1964	1964
Population	107,000	65,000	68,000
Planned Gross Density (persons per acre)	9	17	13
Average Number of Shops at Neighborhood Center	5	7	15
Public-Sector Development Costs per person housed (£)	10,200	7,000	4,100
Transportation Characteristics:			
Primary Road System	Grid	Linear	Linear
Average Bus Headway (minutes)	30	5	10
Cost of Weekly Bus Ticket (£)	2.40	2.50	3.50
Subsidy as Percentage of Bus Operating Cost	42	5	6

Sources: Potter (1984) and Dupree (1987)

Even with peak headways of 30 minutes, the Milton Keynes bus system required an operating subsidy of 42 percent. Potter suggests that Milton Keynes presents a "worst of both worlds" example — a town that required a ^100 million 'outlay for high-capacity roads (much higher than any other British new town) as well as unusually high bus subsidies.

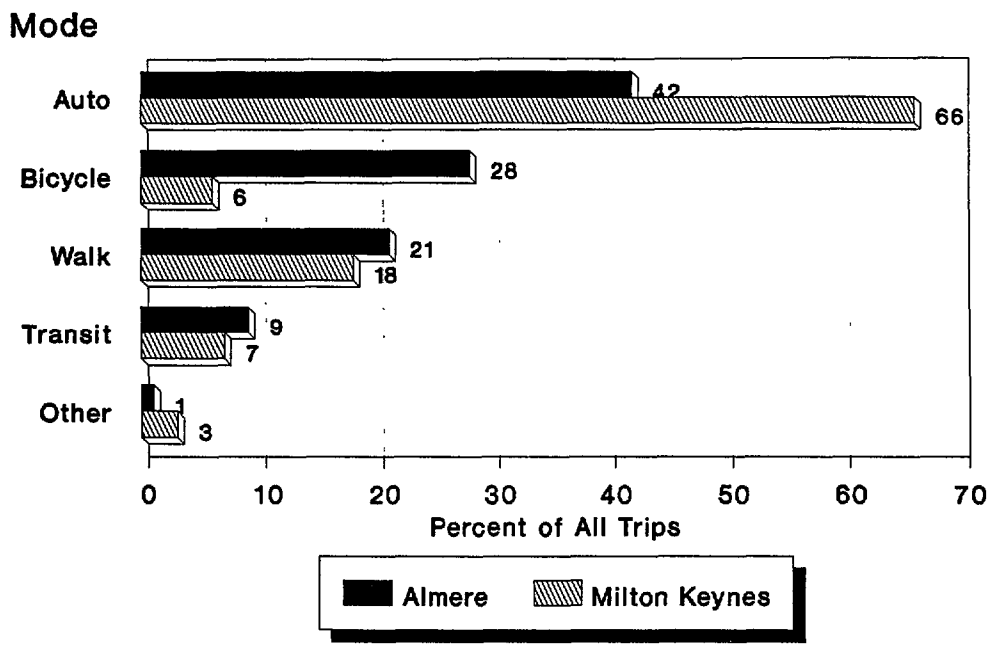
In contrast, Runcorn and Redditch were able to support bus headways of 5 to 10 minutes at a very low per rider subsidy. In 1983, Runcorn's modal split between busway use and private car trips was 53:47, slightly ahead of the master plan assumption of a 50:50 split (Dupree, 1987). In both towns, moreover, road networks have adequately handled auto trafftc with no restrictions on mobility. Because they have separate foot and cycle paths and controlled crossings at grade-level intersections, both Runcorn and Redditch are also pedestrian and bicycle friendly.

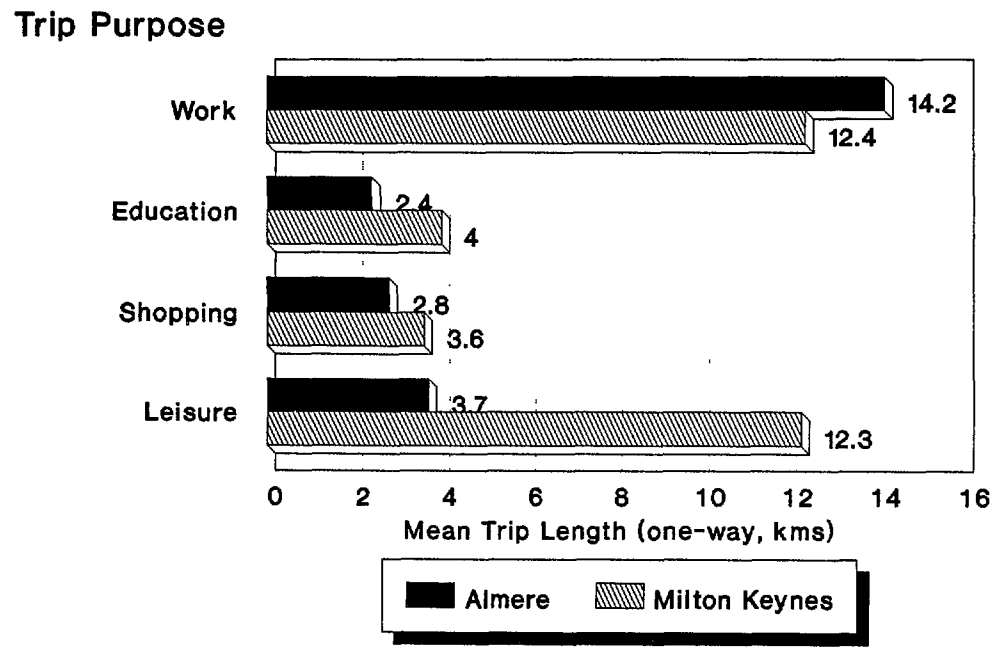
Recently, Roberts and Woods (1992) have contrasted travel in Milton Keynes to Ahnere, a Dutch community around 30 miles east of Amsterdam. While Almere occupies a similar land area, it is slated for a similar target population (250,000) and has a similar average household income as Milton Keynes, its physical design is much different: it clusters related land uses (e.g., shopping, homes, and some jobs) and has two large subcenters and a main town center.16 Milton Keynes averages 1.37 cars per household, compared to 0.94 in Altmere. The two communities, however, have similar counts of bicycles per inhabitant — around 0.60. Figure 6.4 shows that for all trip purposes, Milton Keynes had much higher shares of automobile trips, while Ahnere had higher shares of walking, transit, and especially bicycle travel. Milton Keynes also averaged much longer trips for all purposes except work (Figure 6.4).

5.4. Recap

Great Britain's new town planning experiences provide several valuable policy insights. Planned communities can achieve high levels of self-containment, though in the case of first-generation new towns, this generally eroded as motorization levels increased. Interestingly, the newest generation of new towns are the most auto-dependent yet the most self-contained. Overall, jobs-housing balance and rates of internal commuting are highest for more isolated British communities and when development corporations targetted new housing additions to local workers.

Communities designed for high-quality transit services, like Runcorn and Redditch, average high transit modal splits and low deficits per rider. Full-mobility new towns, exemplified by Milton Keynes, are relatively expensive to serve and almost as auto-dependent as many American cities. While some British scholars have questioned the sustainability of auto-dependent new towns like Milton Keynes, others note that Milton Keynes remains a prosperous community and, unlike some new towns, is experiencing healthy employment growth (Ward, 1993). The most serious liability of planned communities like Milton Keynes, some argue, lies in their relatively high levels of energy consumption per capita (Jacobs, 1991; Breheny et al., 1992; Potter, 1993).





Source: Roberts and Wood (1992)

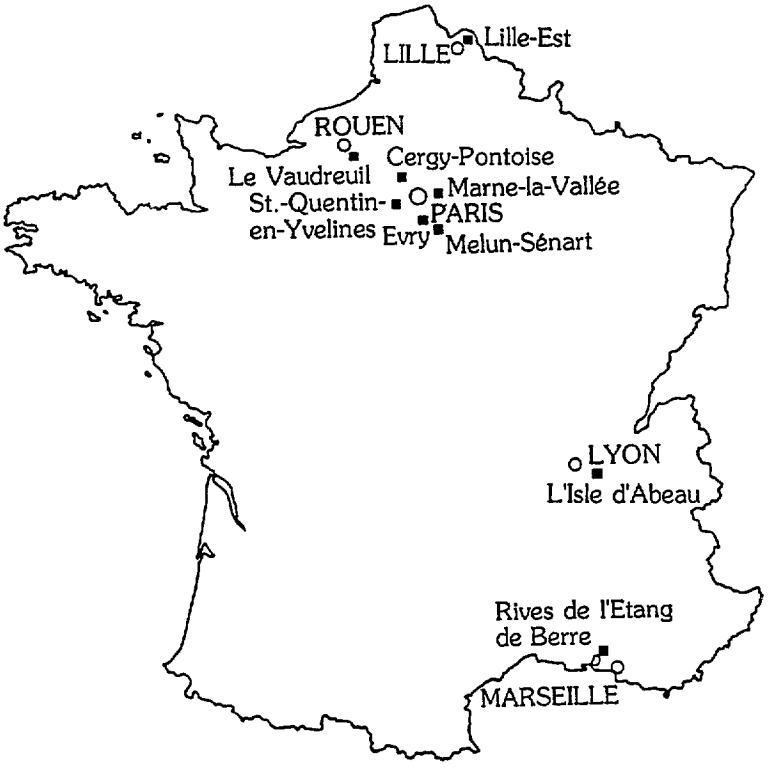
Figure 6.4

Comparison of Modal Splits and Trip Lengths Between Milton Keynes and Allmere, 1991

6. New Town Development and Commuting in France

6.1. Background on French New Town Development

France's new town experiences offer insight into jobs-housing balance issues and spatial patterns of commuting of new town residents and workers. To date, around one million inhabitants have settled into one of nine French new towns— five in the Paris region (Ile-de-France region) and four elsewhere (Map 6.5). As in Britain, planned communities ringing Paris were meant to



Source: Ploegaerts (1992)

Map 6.5

New Towns in France

relieve the national capital of extreme overcrowding after the second world war; by one French account, "the prime objective was to relax the stranglehold on the Paris region, suffocated by galopping and sprawling urbanization" (Dresch, 1993, p. 2). New towns outside of Marseille, Lyon, Rouen, and Lille, on the other hand, were planned as regional growth magnets, mainly to stimulate new industrial activities.

By the early 1960s, rapid population growth, overcrowding, and traffic congestion prompted the French government to weigh options for the Paris region. This was also a time when community services in the suburbs were under-developed and high-rise apartment blocks, hastily built to meet

the acute post-war housing shortage, were under attack by the architectural community. Planned communities on the periphery of Paris were embraced by President Charles de Galle as the answer to the region's woes.

Paris's legacy of monumental construction projects is legendary, going back to Baron Haussman in the 19th century, and the new town experiments of the past twenty years carried on this tradition. The region's 1965 new town plan, Paris Schema Directeur, was bold, visionary, and utopian:

> Nothing so grandiose was ever attempted in the history of urban civilization. The total bill to the French excheqeur was mind-boggling: the twelve-year plan...called for a total of 29 billion francs on highways and 9 billion for public transport, not to mention 140,000 new dwellings a year. Only a country...in the middle of an economic boom almost unprecedented in history, only one with a centuries-old tradition of top-down public intervention, could even have contemplated it (Hall, 1988, p. 314).

The plan rejected most other new town models of the day, including Abercrombie-style British new towns or the spatial formalism of Brasilia; instead it opted for a multi-centered metropolis organized around a regional commuter rail system, modeled after Stockholm though in a metropolis ten times Stockholm's size.

The French government seeded the initial construction of the five new towns outside of Paris. Development started in the center of new towns, grouping infrastructure and public amenities around existing or planned transit networks. Unlike in Britain, however, the French government steered away from real estate development, leaving housing, office, and factory construction to the private sector. Most French new towns segregate pedestrian and vehicle traffic in their cores, and provide easy access to various public transit systems from central areas. All residences are within easy walking distance of a transit hub, and dwelling units generally turn their backs to streets. Transit's prominence is exemplified by dedicated bus lanes and commuter railway in Evry, a regional express rail hub (RER) in Marne-la-Vallee, and the new automated underground (VAL) that terminates in LiRe-Est. Additionally, French new towns take pride in their generous amounts parks and landscaping as well as architectural diversity, expressed by elaborate treatments of form, colors, and materials.

6.2 Development Characteristics of New Towns in Ile-de-France

Table 6.12 summarizes development and transportation characteristics of the Paris region's five new towns (Map 6.6). Marne-la-Vallee is the most populated and, along with Cergy-Pointoise, has grown the fastest over the past decade (Figure 6.5). Both of these new towns have the largest employment base and, along with Saint Quenten-en-Yvelines and Evry, have experienced rapid job

Table 6.12

Summary Development and Transportation Characteristics of New Towns in Ile-de-France

	St. Quentin-en Yvelines	Cergy-Pointoise	Evrv	Melun-Share	Marne-la-Vall$e
Population	128,663	159,152	74,803	80,920	210,000
Population/acre	49.4	50.4	61.5	17.1	34.6
Employment	56,778	75,586	45,846	19,550	73,600
Distance to Paris &II)*	20	25	28	30	13
Number of Regional Rail Lines (RER-SNCF)	2	3	2	2	1
Number of Rail Stations	3	3	5	4	5

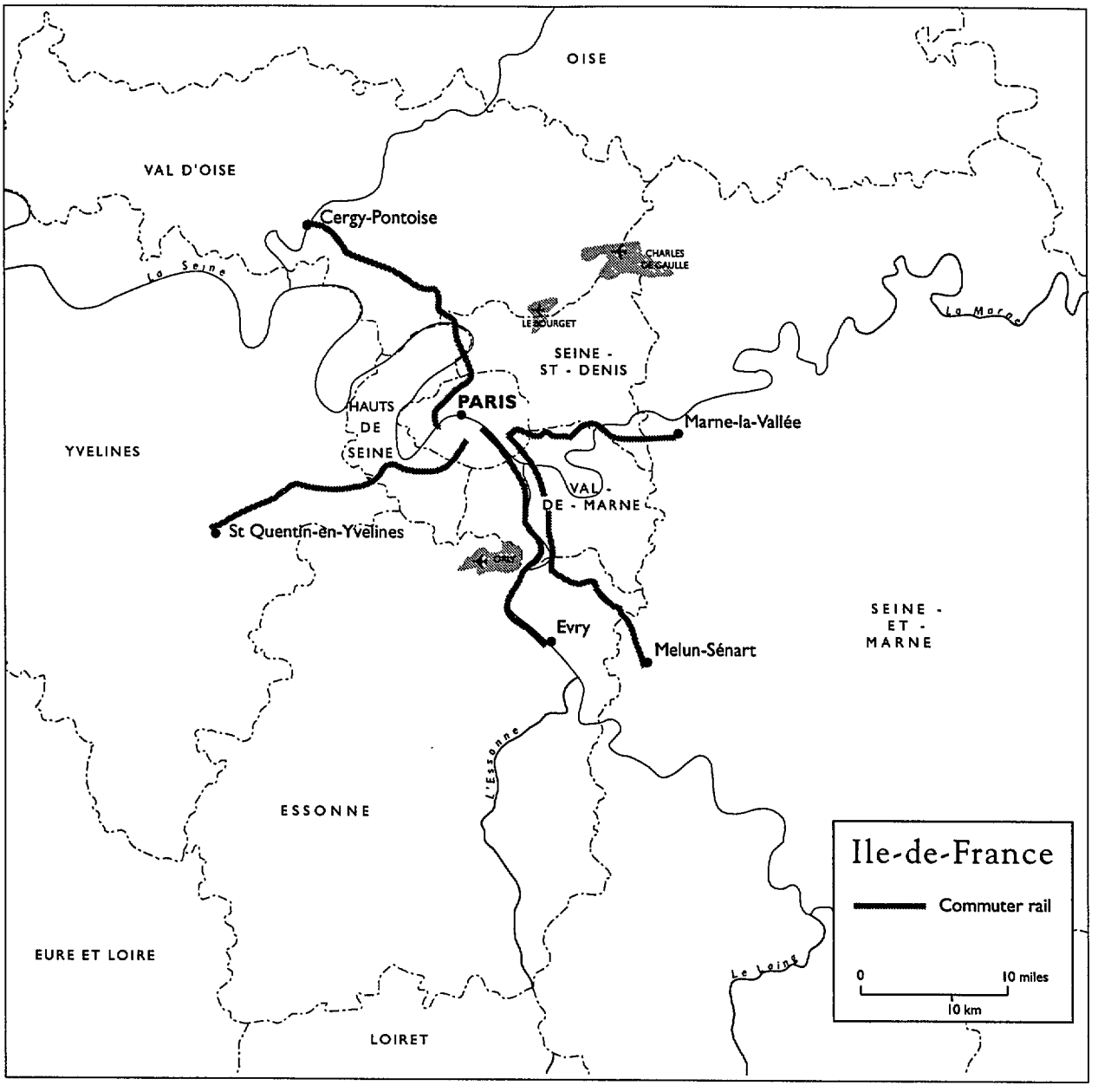
*Distance from town center to Cathedral Notre Dame.
Source: Groupe Central Des Villes Nouvelles, Ministere de L'Equipment, Des Transports et du Tourisme.

growth as well (Figure 6.6). The opening of Eurodisney has fueled much of Marne-la-Vallee's growth, principally in the service sectors. All five new towns are well served by regional commuter and express rail services.

The three towns to the west and south of Paris, Cergy-Pontoise, Saint-Quentin-en-Yvelines, and Evry, are all denser than their eastern counterparts and have prospered the most, economically, over the past decade, emerging as major centers of office, high-technology, and light manufacturing development. New towns to the east have fared less favorably, though the situation in Marne-la-Vallee has turned around with the opening of EuroDisney and the new RER express rail line. From the Start, Melun-Senart lagged behind other new towns because of its mediocre EranSpOrtaEiOn services; however, the construction of a new regional bypass and a TGV (high-speed rail) station, coupled with its low-cost commercial space, promises to turn this around.

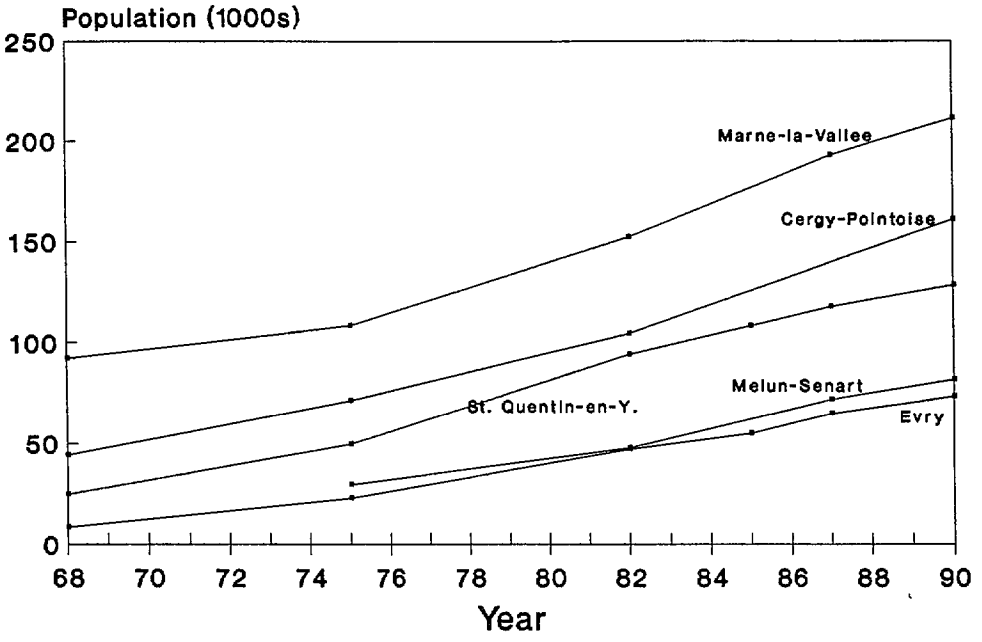
6.3. *Levels of Self-Containment in New Towns of Ile-de-France*

Over the past several decades, Ile-de-France's two easternmost new towns, Melun-Senart and Marne-la-Vallee, have attracted large numbers of foreign immigrants and young families in search of affordable housing. Figure 6.7 shows they have relatively low ratios of jobs-to-housing, though because of Eurodisney's opening, Marne-la-Vallee is becoming more and more balanced. The two rapidly growing westernmost new towns, Saint-Quentin-en-Yvelines and Cergy-Pointoise, are Ile-de-France's most balanced, both with jobs-to-housing ratios between 1.25 and 1.50, a range that is widely viewed as "balanced" (Cervero, 1989) 17 Evry, the technopolis 28 kilometers south of Paris, is the least balanced — averaging 80 percent more jobs than housing units.



Map 6.6

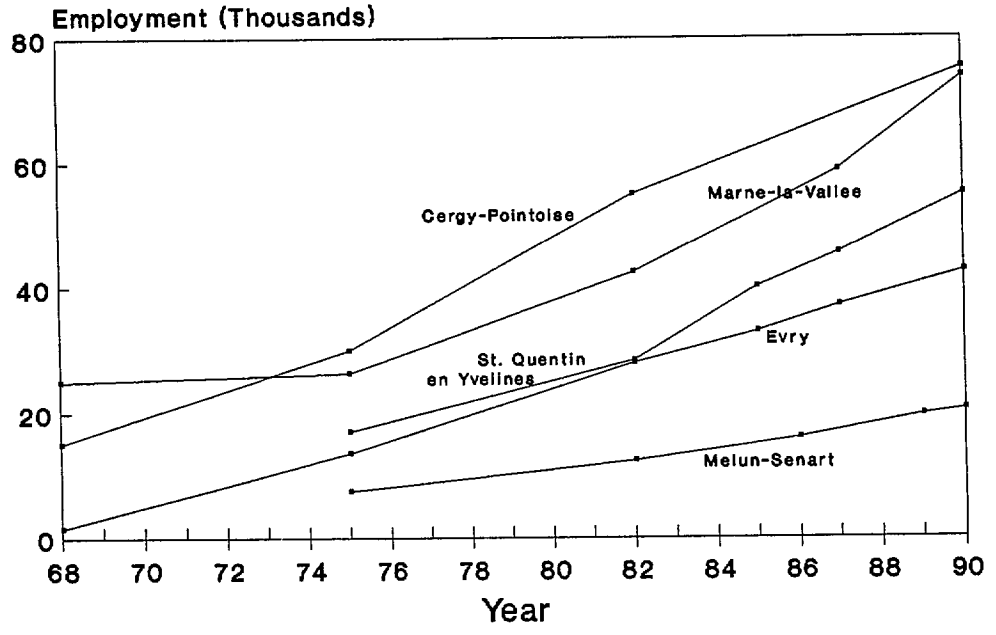
New Towns in Ile-de-France



Source: Groupe Central Des Villes Nouvelles, Ministere de L'Equipement, Des Transports et du Tourisme.

Figure 6.5

Population Trends in New Towns of Ile-de-France, 1968-90



Source: Groupe Central Des Villes Nouvelles, Ministere de L'Equipement, Des Transports et du Tourisme.

Figure 6.6

Employment Trends in New Towns of Ile-de-France, 1968-90

Source: Groupe Central Des Villes Nouvelles, Ministere de L'Equipement, Des Transports et du Tourisme.

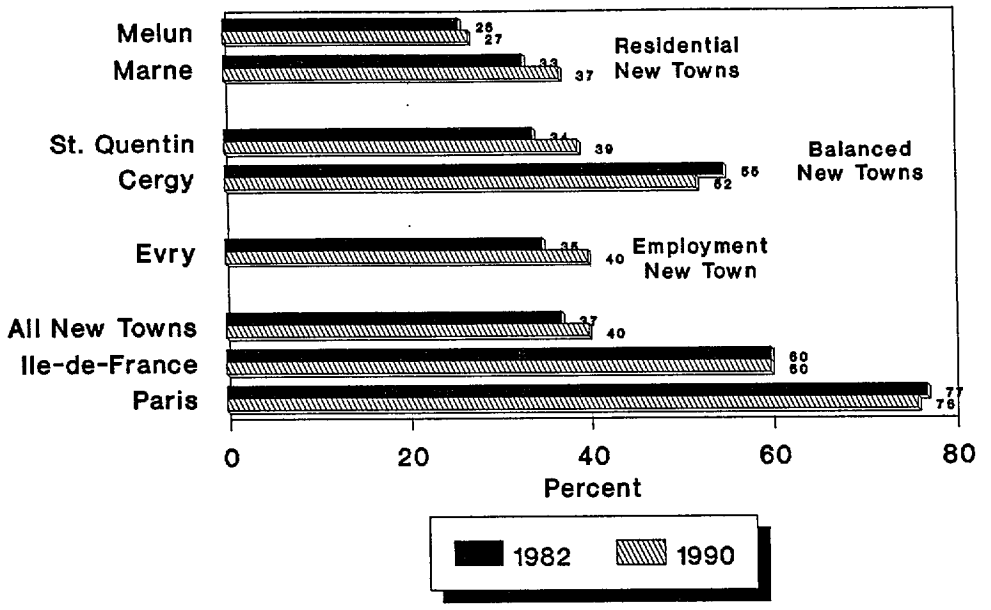
Figure 6.7

Jobs-to-Housing Ratios for New Towns of Ile-de-France, 1982 & 1990

Jobs-to-housing ratios only express the potential for balance. Whether a place is actually "balanced," or self-contained, is better revealed by the share of workers residing in a community and the share of residents working there. While community boundaries are largely political artifacts and do not always correspond to a community's commutesheds, in the case of Ile-de-France's new towns, all have distinct edges and are surrounded by greenbelts. Thus the boundaries of these five new towns are suited for distinguishing commutes that are internal (within) and external (beginning or ending outside).

Figure 6.8 shows that the two "balanced new towns" had among the highest shares of workers residing locally. In the case of Cergy-Pointoise, over half of all workers reside within the community, though the share has fallen since 1982. The "employment new town," Evry, has around 40 percent locally residing workers. In contrast, the two "residential new towns" had the lowest percentage of workers residing withing the community, especially Melun-Senart. Figure 6.8 also shows that compared to other suburban (non-master-planned) communities in Ile-de-France as well as Paris, new towns had far fewer shares of workers taking up residence within the community.

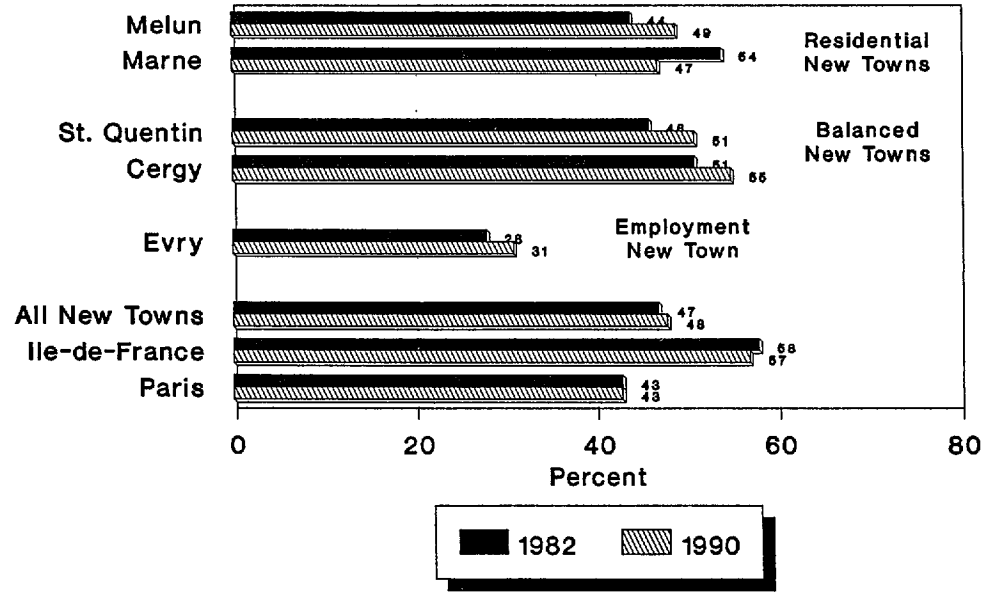
A similar relationship was found for shares of employed residents working in the community (Figure 6.9). The most balanced communities had the largest shares. The next highest shares were for residential communities. By contrast, the employment new town, Evry, had fewer than one out



Source: Groupe Central Des Villes Nouvelles, Ministere de L'Equipement, Des Transports et du Tourisme.

Figure 6.8

Percent of Workers Residing in Community, 1982 & 1990



Source: Groupe Central Des Villes Nouvelles, Ministere de L'Equipement, Des Transports et du Tourisme.

Figure 6.9

Percent of Employed Residents Working in Community, 1982 & 1990

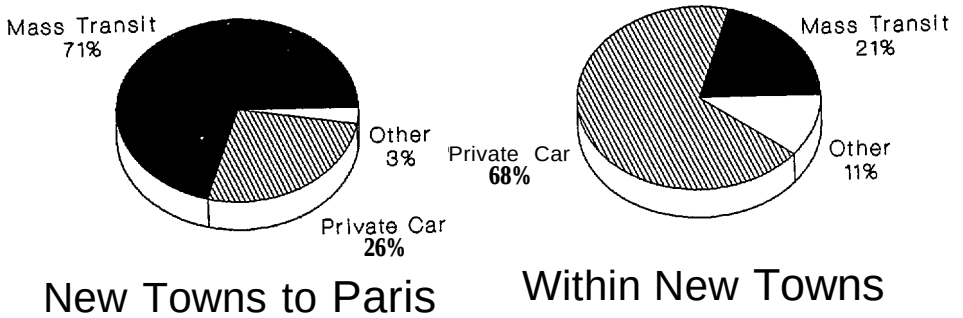
of three employed residents working locally. Again we find that other suburban communities in Ile-de-France were even more self-contained, averaging significantly larger shares of residents who worked in town. New towns, however, do have smaller shares of outbound commuters each morning than Paris.

Overall, Cergy-Pointoise is the most self-contained new town in Ile-de-France, with the majority of workers living locally and the majority of residents working in town. Like Cergy, the next most self-contained, Saint Quentin-en-Yvelines, also has a fairly balanced ratio of jobs-to-housing. The remaining new towns experience in- and out-bound commuting each day. As a massive employment concentration, Evry has relatively large shares of workers commuting within the community, though over two-thirds of residents with jobs leave Evry for work each day. Like Evry, Marne-la-Vallee averages more external than internal commuting. The least self-contained new town, Melun-Senart, has over halfof its workers commuting in from elsewhere each day and around three-quarters of its residents who work commuting outbound. In sum, some numerical balance of jobs and housing units appears to be a necessary though not a sufficient condition toward self-containment in Ile-de-France's new towns.

6.4. Commuting in New Towns of Ile-de-France

While Ile-de-France's new towns are fairly self-contained and well-served by regional transit facilities, this does not necessarily translate into high transit usage for trips made within the community. Figure 6.10 shows that in 1983, the latest year for which commuting data were available, 21 percent of residents who lived in new towns commuted via transit to work. This compares to a 42.6 percent transit modal split for all work trips in Ile-de-France in 1983. (For work trips within Paris, transit carried 76.7 percent of commuters.) In general, transit's internal modal split was fairly similar across new towns. Recent survey work in Evry, however, puts the transit modal split for internal work trips at 31 percent, substantially above the 1983 average for all new towns. This difference is no doubt attributable to Evry's superior bus service that weaves through the community on a dedicated transitway, similar to that found in Runcorn, England. Other new towns, such as Cergy-Pointoise, have promoted internal transit usage in other ways, such as offering free annual passes to their first settlers.

Figure 6.10 also shows that transit's major role lies in ferrying workers in and out of Ile-de-France's new towns. For external commute trips made by new town residents, 71 percent were by transit. The vast majority of these were on the RER-SNCF commuter rail lines. These commuter rail lines recover 94 percent of their operating costs from farebox receipts (Dresch, 1993). Overall, then, we can conclude that transit usage for work trips is the highest in the least self-contained new French towns — ones with large shares of workers and residents commuting in and out of the community. This finding would seem to suggest that as long as a region is well-served by rail transit,



Sources: Groupe Central Des Viiles Nouvelles, Ministere de L'Equipement, Des Transports et du Tourisme; and Conseil Regional D'Ile de France, Direction Regionale de 1'Equipement.

Figure 6.10

Comparison of Modal Splits for Internal and External Work Trips for New Towns in Ile-de-France, 1983

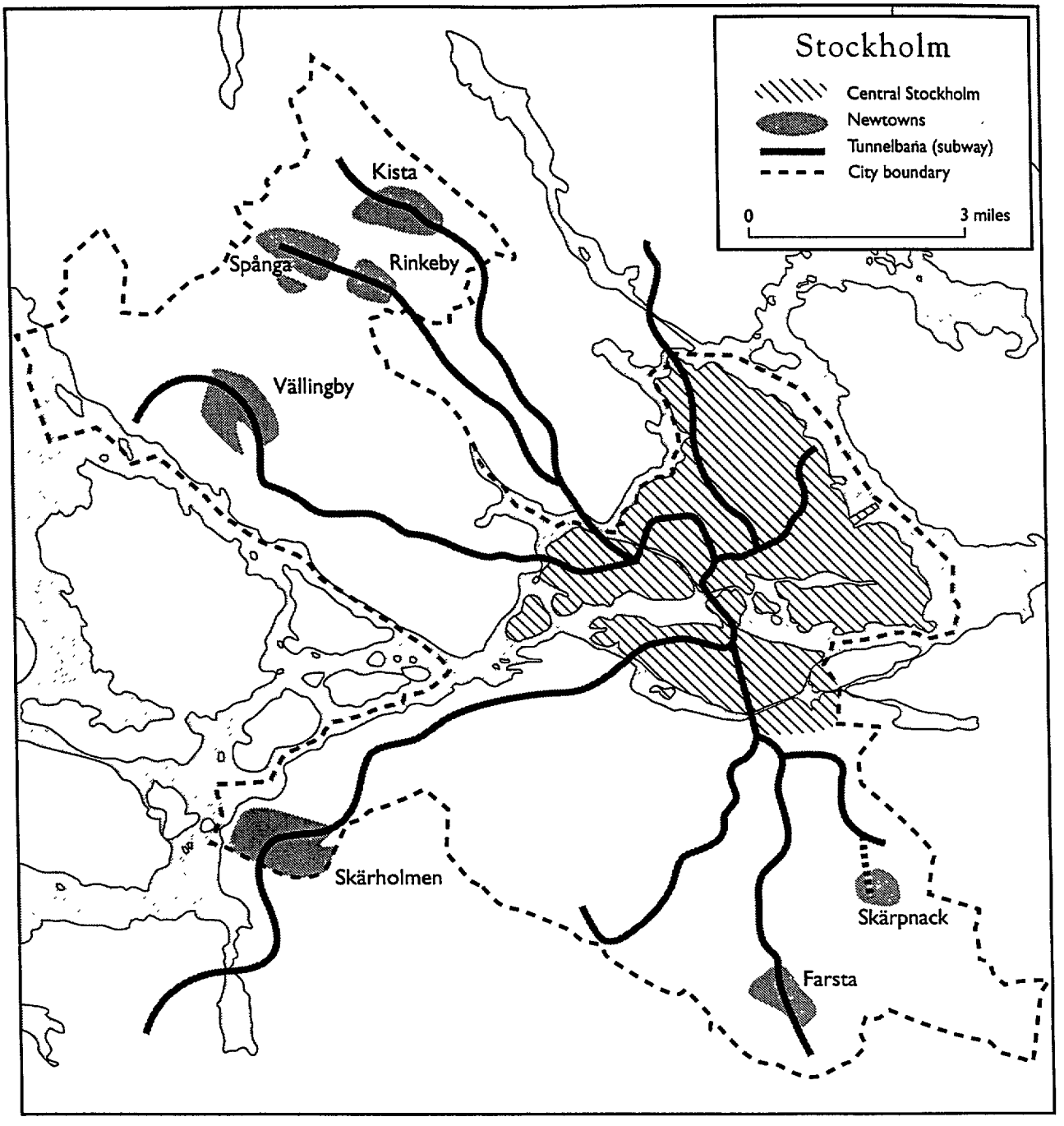
as in Ile-de-France region, levels of self-containment matter little from a mobility standpoint. In fact, the least self-contained communities can be expected to have the highest shares of transit commuting among their residents and workforces.

Where self-containment has likely made the biggest difference in commuting among Ile-de-France's new towns is with respect walk and bicycle trips. Figure *6.10* reveals there were far greater shares of "other" commutes, which comprise mainly foot and bicycle travel, for internal than external trips made by new town residents. All French new towns have superb internal walkway and trail systems, and these numbers confirm that self-containment and good pedestrian facilities can attract significant shares of internal commuters out of motorized vehicles.

7. Commuting in a Transit Metropolis: Stockholm, Sweden

7.1. Building a Transit Metropolis

Stockholm, Sweden, is arguably the best example anywhere of coordinated regional transit and land-use planning. Stockholm, Sweden's capital and largest city, is orbited by a number of planned satellite communities, most of which are served by the regional rail system (Tunnelbana) or commuter railroad (Map 6.7). This "pearls on a string" built form is the direct product of a



Map 6.7

Stockholm Region's New Towns

regional planning effort that targeted overspill growth after World War II to these planned, rail-served communities.

Today, Sweden is one of the most affluent countries in the world with a high automobile ownership rate (2.1 persons/vehicle). Because it was among the last countries in Europe to industrialize, it has experienced rapid growth, particularly in urban centers, over the postwar era. Still, most Swedish cities sit in a large forested country. The stage was set for Sweden's metropolises to easily have followed a highway-oriented development pattern. Yet Europe's most prosperous country took off on a radically different suburbanization path than in America. Why?

Two key factors deserve much of the credit. One, beginning in 1904, the Stockholm city council began purchasing land for future expansion decades in advance of need. By 1980, it owned 70 percent of land within its boundaries and over 230 square miles of land beyond the city limits. Second, after 1934 Sweden was governed for 30 years by Social Democrats, committed to improving housing. During the postwar industrial period, Sweden suffered from a serious housing shortfall, unable to adequately house new immigrants and factory workers. Quarters were cramped with few kitchens and washing facilities[18] After World War II, the Swedish government began constructing multi-story apartments on the outskirts of metropolises. Over 90 percent of dwelling units built after 1946 — virtually all built on the city's land — enjoyed some form of state subsidy. Most were built by municipally owned housing corporations and tenant-owned cooperatives (City of Stockholm, 1989; Stockholms Stadsbygganadskontor, 1972; Hall, 1988).

The blueprint for building Stockholm's transit metropolis was Sven Markelius's General Plan of 1945-52. Markelius, an architect by training, believed that, while suburbanization was inevitable and needed to be accommodated, Stockholm's vitality and pre-eminence as the region's commercial and cultural center had to be preserved, at all cost. This was to be accomplished by building satellite new towns, connected to Stockholm by rail. Despite surveys that showed Swedes preferred low to mid-rise suburban homes, Markelius set about building fairly dense satellite centers so that most residents could be within walking distance of a rail station. He hoped that by doing so, many households would feel it unnecessary to own or use a car to reach downtown Stockholm.

In developing Stockholm's satellite new towns- Vallingby (1950-54), Farsta (1953-61), Skarholmen (1961-68) and Spanga (1964-70) planners sought to avoid a "dormitory town environment." An overriding principle was to distribute industry and offices to satellites roughly in proportion to residential population — i.e., to achieve a jobs-housing balance. Public control of land allowed this. Tax incentives were used to lure industries to new towns and promote company-provided employee housing. New towns were also planned for a mix of housing types (single-family and multi-tenant residences) as well as uses, with offices, shops, civic buildings, and other activities in close proximity to each other.

Markelius's plan did not intend to make them complete towns, however. People were still to think of themselves as Stockholmers. Markelius proposed the rule of halves: half the working inhabitants would commute out of new towns and half of the workforce were to be drawn in from elsewhere. Thus, in contrast to Abercrombie's new towns outside of London, Stockholm's satellites were not meant to be fully "self-contained" more like "half-contained," even though they were planned for a balance of jobs and housing units.

The regional rail system, Tunnelbana, became the device to achieve half-containment. Radial in form, Tunnelbana focused on Stockholm's redeveloped core. Satellite subcenters would function as countermagnets to the main center, leading to efficient, b&directional traffic flows.

7.2. First-Generation New Towns

During 1945-57, the first Tunnelbana line was built, which allowed the first satellite town, Wllingby, to be built in parallel. The first-generation of new towns, called ABC towns (A= housing, B = jobs, and C = services), were designed using a common formula:

- Balanced communities of 80,000-100,000 people, with over 60 percent multi-family housing (at 30 to 80 people per acre);
- A hierarchy of centers — a main commercial and civic center near the rail station, flanked by neighborhood centers **with** schools and **community facilities** (within 650 yards of the main center);
- Tapering of densities — residential densities were highest closest to the main center, high around neighborhood centers, progressively lower away from these centers, so as to make most destinations, including the rail station, easily accessible by foot;19 and
- Separation of pedestrian and bicycle paths from automobile traffic, including grade-separation at intersections.

Built on a monumental Le Corbusier-style scale, with buildings set on vast superblocks in the center of community, these first-generation new towns were later criticized by Swedish architects and sociologist as being too institutional and sterile. Regardless, repeated surveys have found that residents of these towns are quite happy with their surroundings, despite what sociologists contend (Popenoe, 1977).

Briefly, Stockholm's largest first-generation new towns are:

- ***Vallingby.*** Located 8 miles west of downtown Stockholm, Vallingby is dominated by several high-rise apartments at its core. Still, the community of 25,000 residents actually has a wide variety of building types, many made of brick and stucco. The elevated rail station in the core is surrounded by a large open cobblestone plaza, reflecting pools, a civic complex, and a shopping center. Elevated tracks divide the community into two districts. Vallingby's road network consists of loops encircling neighborhoods, with a secondary grade-separated pedestrian path system. The town sits in a park-like setting, surrounded by natural trees and rock outcroppings. Because Vallingby was conceived before widespread automobile ownership, it was planned with relatively little parking in its core. In most neighborhoods, cars are grouped Into small clustered parking lots.
- ***Farsta.*** Located 14 miles outside of Stockholm, Farsta (population 42,000) is the terminus of the southernmost Tunnelbana route. Because it was built by private developers, industrialized

building methods and prefabricated concrete materials were used to construct most apartments. Very high rises surround the central open pedestrian mall, which has three times the car-parking built in Vallingby's core20 Residential neighborhoods are grouped into clusters of 5,000 to 7,000 dwelling units. Compared to other new towns, Farsta has a number of light industries, most located on its periphery.

- ***Skarholmen.*** Situated 9 miles west of central Stockholm, Skarholmen was planned as a subregional center. It has the largest commercial core of all new towns, with an enclosed pedestrian mall and numerous commercial attractions. A vast multi-story parking garage for 4,100 cars was also built, the biggest in Scandanavia Unlike its two predecessors, Skarholmen has no high-rises; most apartments are 2-4 stories, though average densities are high. Residential neighborhoods run east-west in parallel rows, descending down the hillside.

7.3. Later Generations of New Towns

All three large new towns that followed — Sphnga, Kista, and Skarpnack **broke with tradition. Each was designed as a more specialized community. Accordingly, they provide a contrast for studying relationships between planning styles,** land-use patterns, **and travel behavior (see Table** 6.13).

- ***Spanga.*** Built on former military grounds, Spanga has two primary cores— Tensta and Rinkeby. Spanga's development during the late 1960s coincided with the influx of many non-European immigrants to Sweden, thus more out of timing than design it attracted a concentration of low-income, industrial workers. Both Tensta and Rinkeby have rail stations in their cores. Central shopping districts are modest, though nearby farmer's markets flourish. Most apartments are 3 to 6 stories, and buildings are tightly huddled together. Pathways are at-grade, whereas most streets run below skywalks. Spanga introduced Sweden's first residential parking structures, which helped raise densities while preserving open space. Breaking from Markelius's half-containment formula, Spanga was planned as a residential community (jobs-to-housing ratio of only 0.31). It also has the lowest median incomes of Swedish new towns. Among older Swedes, it has gained a reputation as an unsafe place, in part because of press reports of youth gangs that terrorize Tunnelbana passengers.
- ***Kista.*** Located 10 miles northwest of downtown Stockholm, Kista has emerged as Sweden's "Silicon Valley." A few multinational electronic companies located there in the early 1980s taking advantage of its proximity to the international airport and its location on the main auto route to the university town of Uppsala. Today over 200 companies and more than 20,000 employees have moved to Kista. With a jobs-to-housing ratio of 3.84, it could hardly be called a self-contained community (Table 6.13). Most companies are within walking distance of Tunnelbana, interconnected by a vast grade-separated pathway system (Photos 6.1 and 6.2). The centerpiece of Kista is the Electrum Complex, an indoor shopping and business mall that includes training and conference facilities. Compared to earlier new towns, Kista has a variety of housing, including some high-rise apartments, terrace garden apartments, duplexes, and single-family detached. Cul-de-sacs are used to restrict automobile access within neighborhoods.
- ***Skarpnack.*** The newest new town, Skarpnack is just 6 miles south of central Stockholm. Designed as a neotraditional community, Skarpnack is radically different than its predecessors. Its designers, reacting to the massive scales and the institutional "feel" of previous new towns, sought to create an urban milieu that was human-scale — 2-3 story structures, a gridiron street pattern, a fine-grained integration of uses, and ground-level retail stores and sidewalk cafes on the main street (Photo 6.3). Additionally, street crossings are at grade. Planning for Skarpnack began almost 40 years ago, but the town only began receiving residents in the late 1980s. A mix of housing types is available, though one consistent design feature is brick facades. Apartments

Table 6.13

Population and Development Characteristics of Stockholm's New Towns

	New Towns					
	First Generation1	Spanga 2	Kista	Skarpnack 3	Taby	Central Stockholm
Population						
1980	102,500	42,225	29,081	26,237	47,105	226,405
1990	96,124	44,105	36,415	25,785	56,714	240,098
Employment						
1980	56,298	21,260	15,185	13,516	24,916	114,433
1990	50,548	21,363	18,545	13,676	32,791	324,026
Density (Dwelling Units/ Gross Acre, 1991)	8.2	14.6	4.7	5.0	1.2	8.0
Percent D.U. Multi-Family (1988)	86.1	99.5	91.4	90.8	48.3	99.9
Jobs-to-Housing Ratio (1990)	1.02	0.31	3.84	0.58	0.64	1.98
Median Household Disposable Income ($, 1988)	12,400	8,580	10,020	10,350	11,600	11,930
Percent Population Non-Swedish Origin (1988)	28.3	51.3	16.9	24.0	10.8	12.1

1 These are statistics for Vallingby, Farstay and Skarholmen combined.
2 Consists of Tensta and Rinkeby.
3 Statistics shown are for the Skarpnack district. The planned new town is a small portion of this district, and is planned for up to 3,000 dwelling units at build-out.

Source: Stockholtns Lans Landsting.

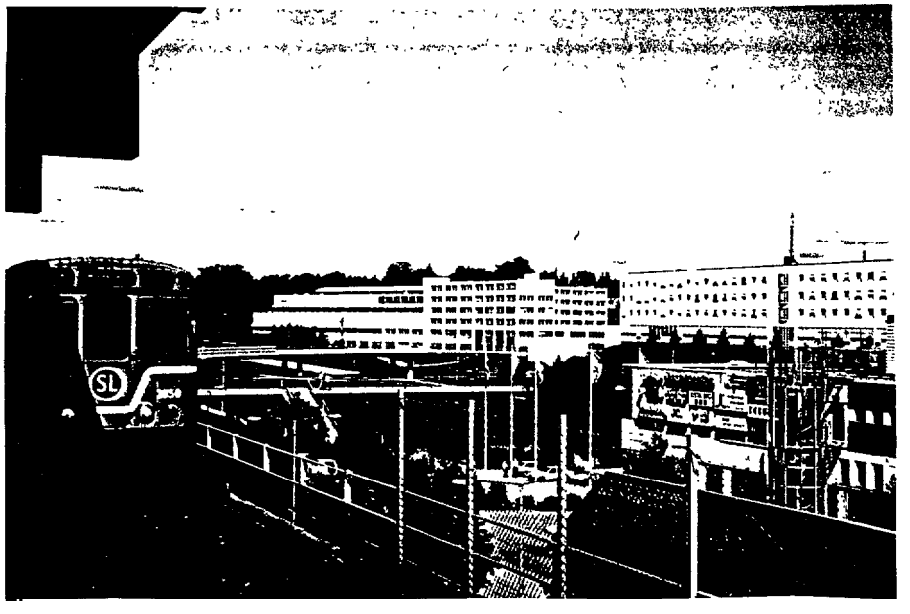


Photo 6.1

Central Kista: Connection of Tunnelbana Station to Nearby Office Towers by Same-Grade Pedway

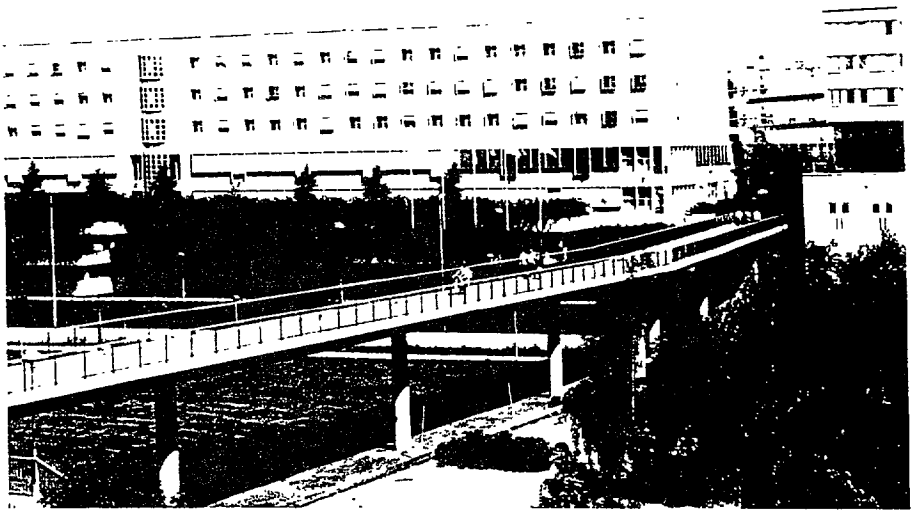


Photo 6.2

Kista: Same-Level Pedway Accommodates Pedestrians and Cyclists

Photo 6.3

Skärpnack: Sidewalk Cafe Surrounded by Apartments in Central Skärpnack

are concentrated in the center with row houses and some single-family structures farther away (Photo 6.4). The majority of offices and light industries are along the perimeter of Skarpnack Most residential and office parking is in garages. While laid out on a grid, every other street ends in a cul-de-sac to preserve enclosed courtyards. Though there are currently no rail services, a new Tunnelbana rail station will open in 1995.

In summary, the newest generation **of Stockholm new towns are quite different from the first — Spanga is an ethnically mixed bedroom community, Kirsta is a technopolis, and Skarpnack is evolving as a neotraditional community in the purest sense.**

Photo 6.4

Skarpnack: Residential Cluster in Central Skarpnacj With Commons Area, Alley Access, and Tree-Lined Buffers

7.4. Balance and Self-Containment

Stockholm's new towns have varying degrees of jobs-housing balance. Spanga has three times as many housing units as jobs. The newest planned community, Skarpnick is also largely a residential enclave, though in striking contrast to Spanga, has a traditional urban design. The first-generation new towns, Vallingby, Farsta, and Skarholmen, are most balanced, with roughly equal numbers of jobs and housing units. And Kista, the region's technopolis, has nearly four workers for every dwelling unit.

Table 6.13 also presents statistics for a "control" suburban community, Taby, which lies roughly the same distance from downtown Stockholm as the new towns. Taby, however, is not a planned community, but rather evolved as one of the region's first market-driven suburbs, originally housing upper-income families in search of single-family living. Taby is a suitable comparison com-

munity because, besides lying a similar distance from Stockholm, it has comparable average household incomes. Its share of single-family dwellings is much higher than any of the new towns, however, producing a low average population density. It is also home to a much higher share of native Swedes. Taby is not on a Tunnelbana line, though it is served by a passenger railroad line, and, like most Swedish communities, excellent bus transit.[1] With a jobs-to-housing ratio of 0.64, Taby is predominantly a bedroom community. The other comparison community shown in Table 6.13, central Stockholm, has roughly two jobs for every dwelling unit.

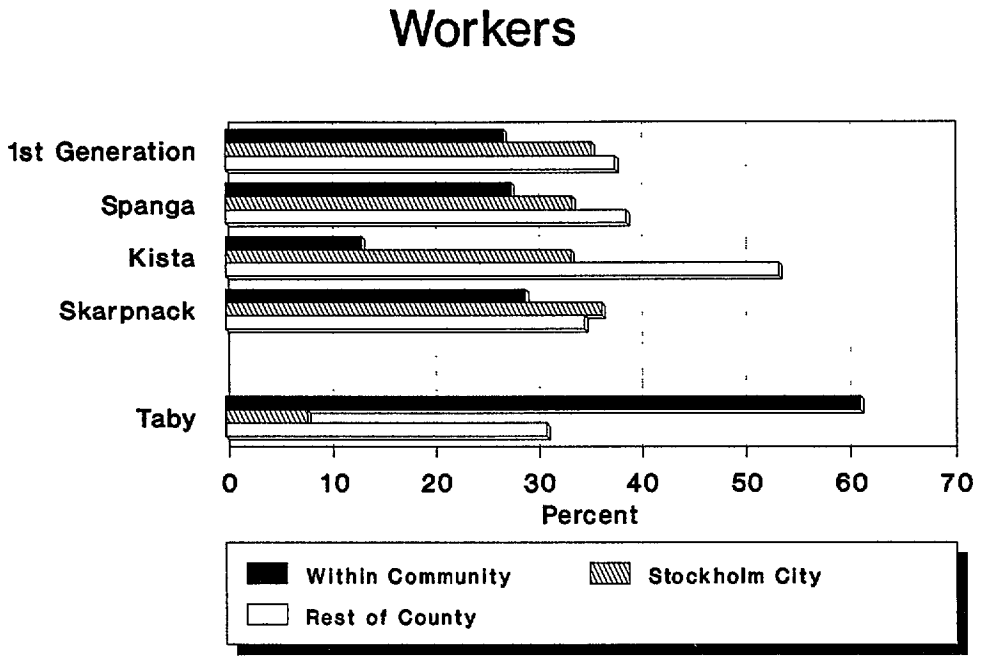
Has jobs-housing balance allowed for some degree of self-containment? The answer has to be an unqualified no, regardless of how balanced a community is. Figure 6.11 shows that small shares of workers live in new towns and even smaller shares of residents work where they live. For all new towns, fewer than one out of three workers live within the community, and in the case of the technopolis, Kista, the share falls below 15 percent. Far more workers live in Stockholm and reverse commute, and even more live elsewhere in Stockholm county, either using cross-county bus transit services or their own automobiles to get to work. The non-master-planned comparison community, Taby, has a much larger share of locally residing workers, though part of this is explained by Taby's larger land area.

In all cases, fewer than one out of five new town residents with jobs are locally employed. The overwhelming majority work in Stockholm and, as we will see, commute by rail transit. It appears, then, that the region's new towns are inhabited mainly by households interested in being near a rail station so its workers can commute to Stockholm by train. Even larger shares of new town residents commute to destinations outside of Stockholm than within their own community.

These numbers suggest that Stockholm's satellites are closely tied to and economically dependent on the rest of the region. They are far from being self-contained, or even half-contained, as Sven Markelius hoped for. All have commuting independence indices (internal/external commutes) of under 0.15 (Figure 6.12). These fall well below those of the "natural" suburb, Taby, and Stockholm city. Whereas many British new towns, like Milton Keynes, are highly self-contained, with indices well above 1.0, Stockholm's new towns average a tremendous amount to inbound and outbound commuting each day. Contrary to popular accounts, the satellites of Stockholm are anything but self-contained.

7.5 Commuting Patterns of Stockholm's New Towns

With high levels of external commuting and large concentrations of housing and workplaces near rail stations, we would expect Stockholm's new towns to rank high as centers of rail commuting. Figure 6.13 shows that in the case of all new towns, over half of all workers and more than a third of residents commute via transit each day. These shares are considerably higher than those of the comparison suburb, Taby Clearly, Stockholm's new towns have come far closer to achieving "half transit



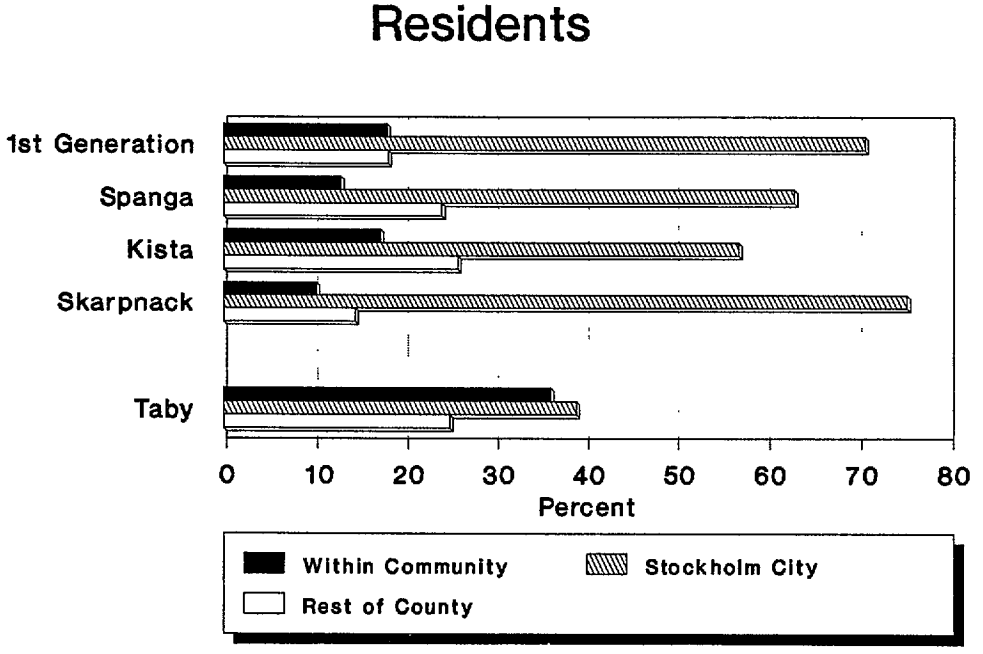


Figure 6.11

Percent of Workers Residing in and Percent of Employed Residents Working in New Towns, 1990

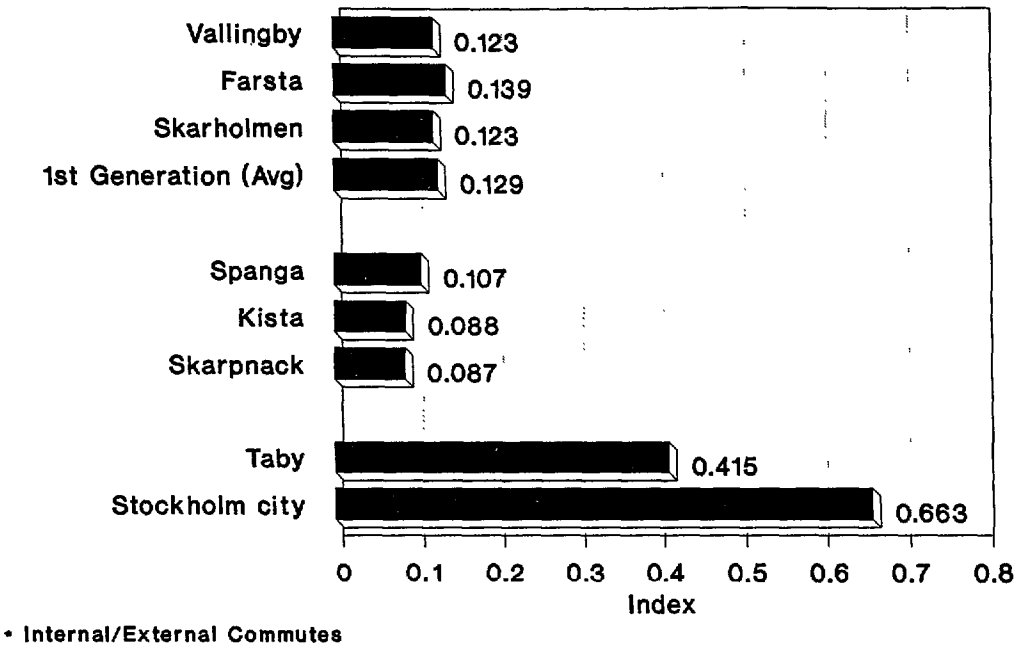


Figure 6.12

Indices of Commuting Independence* for Stockholm's New Towns, 1990

commuting" than "half-containment." Evidently, the built form of rail-fed suburbs and outside dependency for employment has led to transit's extraordinary market share of journeys-to-work.

In the case of Kista, the technopolis, and Skärpnick, the neotraditional town, more than twice as many of their workers take transit each day as drive. While residents of new towns rely heavily on transit to reach their jobs, with the exception of Skärpnick, even larger shares travel in automobiles. Figure 6.13 shows that new town residents are more transit-dependent than residents of Täby, though far less than Stockholmers or other residents of Stockholm county. The figure also reveals that among new towns, larger shares of residents got to work by foot in Skärpnick, the "human-scale" new town without grade-separated pathways.

Transit usage was found to vary considerably depending on where commuters were coming from and going to. Figure 6.14 shows that over half of new town residents who worked locally got to work by walking or bicycle. Moreover, nearly one out of four took bus transit to work. And if new town residents worked in Stockholm, over three-quarters commuted via transit. If, on the other hand, new town workers lived in Stockholm, around 60 percent reverse-commuted on transit. These patterns held for all sets of new towns.

While having central rail facilities and good pedestrian and bus connections account for much of transit's success in new towns, other complementary factors have played a role as well. Rail fares are low. Parking fees and fuel taxes, on the other hand, are high. Sweden also has

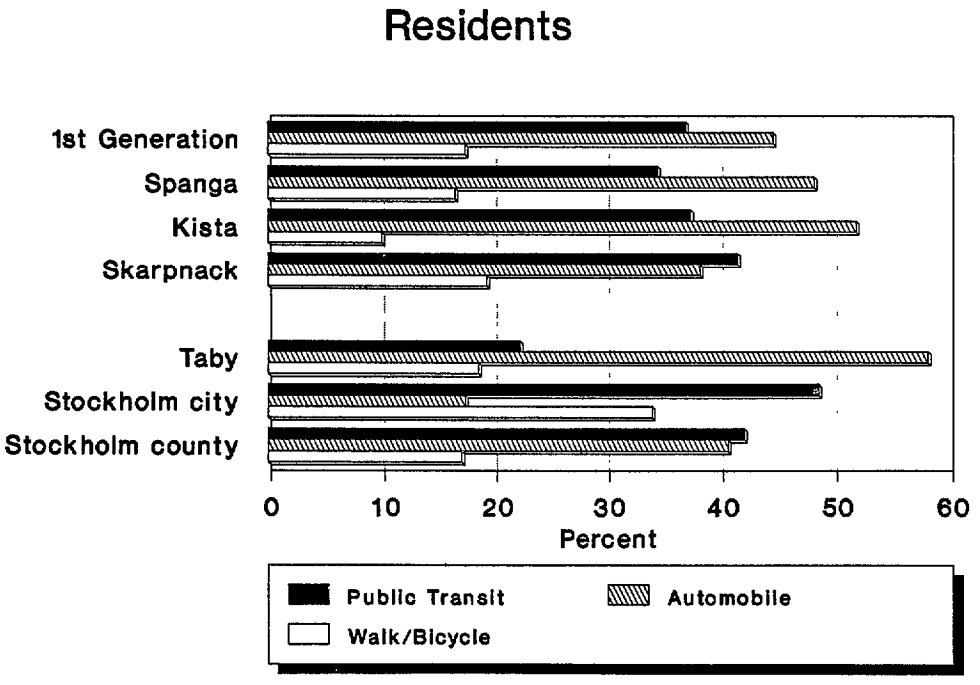


Figure 6.13

Work Trip Modal Splits for Employees and Residents of Stockholm's New Towns, 1990

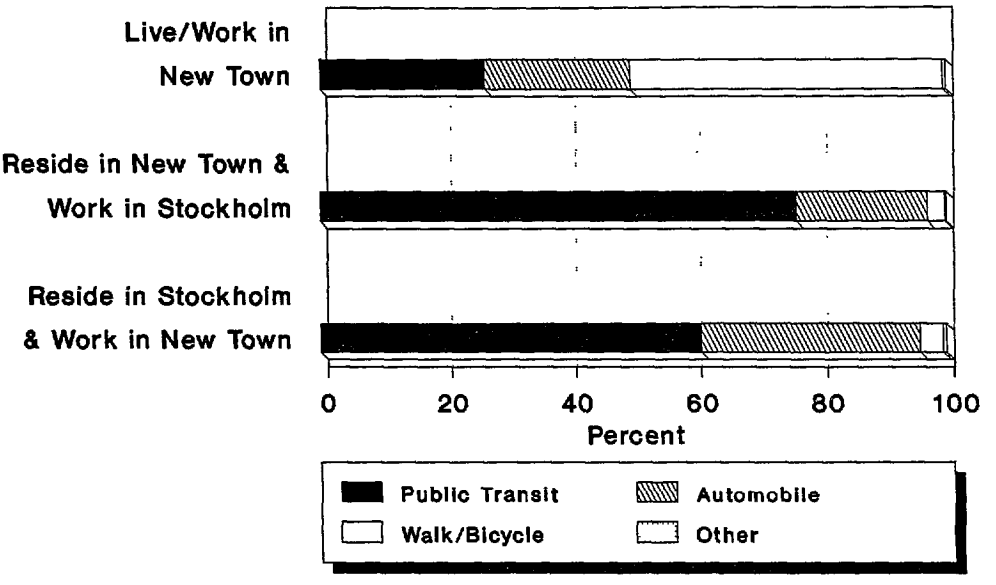


Figure 6.14

Work Trip Modal Splits for Stockholm New Towns, Spatial Markets, 1990

among the highest value-added taxes on motor vehicles and vehicle registration fee structures anywhere (McShane and Koshi, 1984; Pucher, 1988).

The importance of walking and bicycling for internal commutes by resident-workers of new towns is underscored by Figure 6.15. Compared to the "natural" suburb, Täby, much larger shares of internal trips in new towns are by foot, bicycle, and bus. Over half of all work trips made by resident-workers of neotraditional Skärpnick are by foot and bicycle. Though data were not available, it is likely that even greater shares of internal non-work trips, such as for shopping and social visits, are by non-motorized means. Kista, the high-tech center, is the only new town with larger shares of internal work trips made by bus than by car— nearly a third of its resident-workers commuted by transit.

7.6. Recap

Over the past 50 years, greater Stockholm has transformed from a pre-war monocentric city to a planned post-war polycentric metropolis. Tunnelbana, the regional rail system, has emerged as the lifeline of this multi-centered metropolis. Like pearls on a necklace, most of the region's new towns are efficiently served and interconnected by rail transit.

The region's first-generation of new towns were consciously planned to promote rail commuting into Stockholm as well as to be somewhat self-contained. Commuting statistics reveal that they have certainly achieved the former objective but have been far off the mark of the second. More

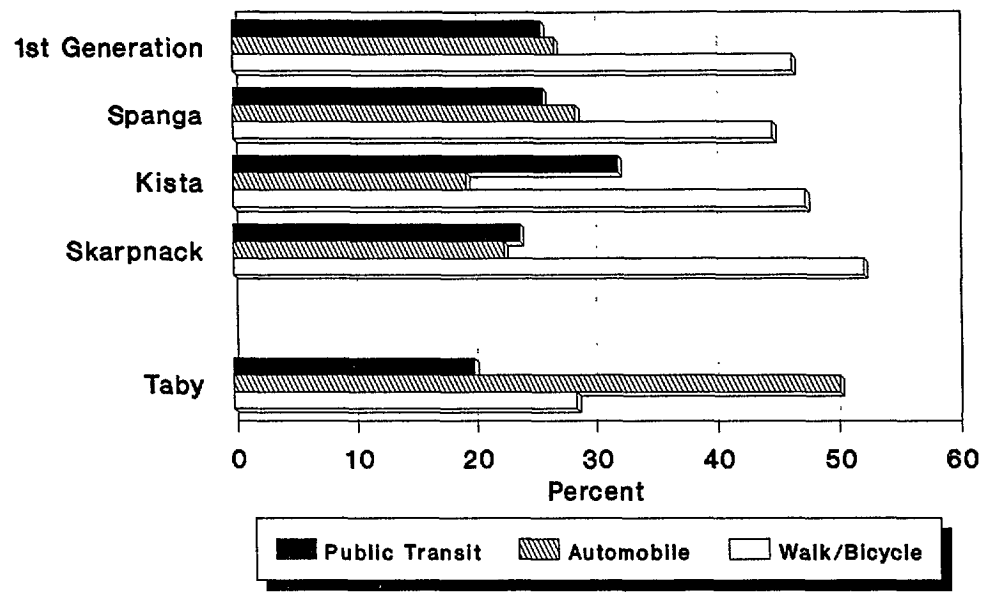


Figure 6.15

Modal Splits for Internal Commutes by Resident-Workers of Stockholm's New Towns, 1990

recent new towns broke the mold of their predecessors, becoming more specialized centers. Newer new towns are even less balanced than their predecessors and are no more self-contained.

Contrary to popular belief, all Swedish new towns have much higher levels of external than internal commuting. What external commuting does take place, however, is heavily oriented to transit, particularly for commutes into Stockholm. For internal work trips by resident-workers, foot and bicycle travel are the preferred means. Skärpnick, the region's only neotraditional new town, has the highest share of non-motorized commuters.

In summary, experiences in greater Stockholm indicate that jobs-housing balance and self-containment are not prerequisites to achieving high shares of transit and non-SOV commuting. While British new towns are far more balanced and self-contained than their Swedish counterparts, they are also more auto-dependent. Newman and Kentworthy (1989) have shown, for instance, that metropolitan Stockholm averages 3-4 times less fuel consumption per capita than comparable-size U.S. cities (with similar average incomes). Clearly, Stockholm's success stems directly from having dense, mixed-use suburbs that are superbly served by rail. This has more than compensated for any lack of jobs-housing balance and self-containment. Overall, Stockholm's success is the outcome of careful and coordinated regional planning of new towns and rail transit over the post-WWII period.

8. Conclusions and Policy Lessons

This chapter has provided a Euro-American perspective on how community form and planning principles can influence travel behavior. Neotraditionalism, Edge Cities, and planned communities, both in the U.S. and abroad, were the lenses through which fundamental relationships between land-use patterns and commuting choices were examined.

Comparisons of commuting behavior between residents of ten traditional U.S. communities revealed that their greatest advantage lies in encouraging more walk and bicycle as well as shorter trips. The study of Edge Cities suggested that densities and mixed land-use compositions paid off only if Edge Cities are served by rail transit.

American new towns were found to have relatively large shares of residents working within the community. This produced shorter average commutes in new towns, though resident-workers were generally as auto-reliant as outside workers. Balanced new towns had slightly higher shares of transit and non-SOV commuting. In general, America's new communities seem to enjoy some modest mobility benefits.

The best evidence on the link between community planning and commuting is from Europe, which has a far longer history of new town development. Britian's early new towns were designed to handle London's postwar spillover growth. Latter new towns, like Milton Keynes, became regional growth magnets. These newer, more remote, and more auto-oriented new towns also became the most self-contained. High levels of internal (and thus short-distance) commuting in fully motorized new towns partly compensate for their high per capita energy consumption. Where high-quality transit services exist, such as in Runcorn,vehicle miles of travel can be reduced even more.

Both Paris and Stockholm provide stark contrasts to Britain's new town experiences. Paris is surrounded by a mix of rail-served satellite communities — some are balanced and others are mainly residential enclaves and employment centers. The least self-contained communities, however, average the highest share of work trips by transit- mainly in the form of workers in-commuting and residents out-commuting by rail. Although planned as fairly self-contained places, Stockholm's new towns have a tremendous amount of external commuting. However, as in Paris, external commuting is predominantly in the form of rail transit trips. What internal commuting does take place tends to be by foot and bicycle. Thus, new towns outside of Paris and Stockholm are success stories from a regional mobility standpoint in spite of their lack of balance or self-containment. Indeed, there is an inverse relationship between selflcontainment and transit commuting. It is because of their economic interdependence with the surrounding region that so many French and Swedish new town residents and workers commute by transit.

In conclusion, findings from this chapter suggest that having good quality transit services is the key to luring commuters out of their automobiles, with such land-use considerations as density, neotraditional designs, jobs-housing balance, and self-containment of secondary significance.

Characteristics of the built environment exert their greatest influence on internal commuting- in particular, self-containment and traditional urban designs usually encourage more foot and bicycle travel. Indeed, the weight of the evidence suggests that suburban communities with strong economic linkages to a region's core and subcenters, high-quality transit services between these centers, and convenient internal pathway systems yield the greatest mobility benefits.

Notes

1Suburbs were defined as outside of the central city or cities of each metropolitan area. The corresponding metropolitan areas were: Alexandria -Washington, D.C. MSA; Annapolis — Baltimore MSA; Coral Gables — Miami-Ft. Lauderdale CSA; Edmonds — Seattle-Tacoma MSA; Folsom — Sacramento MSA; Lake Forest — Chicago-Gary CSA; Princeton — Newark-New Brunswick MSA; and Winter Park — Orlando MSA.

2In Alexandria, the same proportion of residents walked or cycled to work as the metropolitan average. So, in eight of the communities, at least as large of a share of residents walked or biked to their jobs as in their respective regions.

3New Communities Program (Title VII of the Urban Growth and New Community Development Act of 1970).

4A jobs-to-housing ratio of 1.5 signifies balance, accounting for the fact that usually around 70 percent of all households have two wage-earners and around 3 to 5 percent of units are vacant because of changes in ownership and for other transitional reasons (Cervero, 1989).

5Seven other new towns have been built in Wales and Scotland as well; however, since most studies on transportation impacts have concentrated on English new towns, experiences outside of England are discussed only in passing.

6In order of their date of designation, Mark I new towns built on the periphery of London were: Stevenage (1946), Crawley (1947) Hemel Hempstead (1947), Harlow (1947), Hatfield (1948), Welwyn Garden City (1948), Basildon (1949) and Bracknell (1949). Not all Mark I new towns orbited London, however. Two new towns, Aycliffe (1947) and Peterlee (1948), were also constructed outside of Newcastle to house industrial and mining workers and their families. Corby (1950) was designed to provide housing for steelworkers and stimulate employment growth in the area. In Scotland and Wales, the new towns of East Kilbride (1947) Glenrothes (1948), and Cwmbran (1949) were constructed mainly to house local factory workers.

7In order of their designation, Mark II new towns were: Skelmersdale (1961), Runcorn (1964), Redditch (1964), and Washington (1964) in England; Cumbernauld (1955), Livingston (1962), and Irvine (1966) in Scotland; and Newtown (1967) in Wales. They were planned for an initial population of 100,000 and to grow up to 200,000 to 300,000 at build-out. As Hall et al. (1976) note, however, generalization is difficult because many new towns of the 1960s were diversified, some functioning as spillover catchments and others as major regional centers.

8In order of designation, Mark III towns, all in England, are: Milton Keynes (1967), Peterborough (1967), Telford (1968), Northamption (1968), Warrington (1968), and Central Lancashire (1968).

9This is quoted from the Reith Committee, whose recommendation of the need to plan for London's overspill growth led to the passage of the 1946 New Towns Bill, which provided the basis for new town development in England over the ensuing 45 years.

10Thomas (1968) investigated only the eight Mark I spillover new towns around greater London. Cresswell and Thomas (1972) expanded the analysis to include several Mark II new towns as well. Breheny's (1990) study provided 1971 and 1981 statistics for all British new towns.

11From 1951 to 1966, the trend also favored new towns. For a number of "natural" communities in Berkshire, their average independence index fell from 1.32 in 1951 to 0.82 in 1966. Over the same period, the average

index for the eight new towns around London increased from 0.96 to 1.39. (In his original work, Thomas calculated the weighted-average index, which for the eight new towns actually rose from 0.85 to 1.33.)

12 Several researchers have commented on the broader transportation impacts of Mark I new towns. According to Potter (1984), these communities were planned for the following work trip modal splits: car (16 percent); bus (38 percent); bicycle (38 percent); and walk (8 percent). While few travel surveys were conducted on Mark I new towns, a 1976 survey of Crawley's town center found work trip modal splits of: car (63 percent); bus (10 percent); walk (19 percent); cycle (3 percent); and other (5 percent) (Dupree, 1987). Potter (1984) notes most Mark I new towns (except Aycliffe) failed to achieve their desired pedestrian orientation because they were too small to support enough services, forcing inhabitants to travel out of town for some shopping and personal trips. Most Mark I towns also concentrated the main industrial development into one large estate, which led to heavy tidal traffic and in some caes to peak period congetion along connecting thoroughfares.

13 From 1971 to 1981, the new town average index fell to 0.95, a 28 percent drop. This compares with the average for the other towns of 0.98, a percentage fall of only 6 percent (Breheny, 1990).

14 Redditch adopted a similar, although much less exclusive, figure eight busway system. In Redditch, short lengths of reserved bus routes prevented regular vehicles from using the figure eight route for cross-town journeys. The city was laid out so that most homes were within eight minutes' walk of the bus stop. Dupree (1987) maintains similar results were achieved in Redditch as in Runcorn but at a substantially lower cost.

15 Potter (1982, p. 81) notes that "tucked away in the Transportation Technical Supplement (of the Milton Keynes Plan) was the admission that 'in light of the selected land use plan, the provision of a competitive form of public transport does not make practical sense. This consideration of freedom of choice (between travel methods) has therefore been discounted' and 'the appropriateness of providing a public transport service beyond the minimum level necessary...is solely a matter of policy'." Potter (1984, p. 156) noted that the Milton Keynes Development Corporation, in a local newspaper advertisement, suggests to prospective residents that "if you haven't got a car, you might have to think about buying one."

16 Milton Keynes' gross densities are actually around three times higher than Almere's.

17 This range accounts for the existence of two-earner households, which today in the U.S. make up around three-quarters of all households, plus normal housing vacancies.

18 At the end World War II, 52 percent of Stockholm's housing stock consisted of no more than one room and a kitchen.

19 Plans placed most high-rise apartments within 500 yards of the main center, row houses and single-family dwellings within 980 yards, and factories and workplaces within 650 yards.

20 While not initially planned for, Farsta's plan was modified to provide 2,000 mostly surface parking spaces near the core. Parking was not only for visitors and workers, but also to attract large Swedish chain stores, something the private developers felt was essential if the development was to be financially successful.

21 Stockholm city council proposed extending a Tunnelbana line to Taby; however, local officials refused the offer, purportedly because of concerns over other population classes riding transit to their community.

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